Über dieses Buch

Dies ist ein digitales Exemplar eines Buches, das seit Generationen in den Regalen der Bibliotheken aufbewahrt wurde, bevor es von Google im Rahmen eines Projekts, mit dem die Bücher dieser Welt online verfügbar gemacht werden sollen, sorgfältig gescannt wurde.

Das Buch hat das Urheberrecht überdauert und kann nun öffentlich zugänglich gemacht werden. Ein öffentlich zugängliches Buch ist ein Buch, das niemals Urheberrechten unterlag oder bei dem die Schutzfrist des Urheberrechts abgelaufen ist. Ob ein Buch öffentlich zugänglich ist, kann von Land zu Land unterschiedlich sein. Öffentlich zugängliche Bücher sind unser Tor zur Vergangenheit und stellen ein geschichtliches, kulturelles und wissenschaftliches Vermögen dar, das häufig nur schwierig zu entdecken ist.

Gebrauchsspuren, Anmerkungen und andere Randbemerkungen, die im Originalband enthalten sind, finden sich auch in dieser Datei – eine Erinnerung an die lange Reise, die das Buch vom Verleger zu einer Bibliothek und weiter zu Ihnen hinter sich gebracht hat.

Nutzungsrichtlinien

Google ist stolz, mit Bibliotheken in partnerschaftlicher Zusammenarbeit öffentlich zugängliches Material zu digitalisieren und einer breiten Masse zugänglich zu machen. Öffentlich zugängliche Bücher gehören der Öffentlichkeit, und wir sind nur ihre Hüter. Nichtsdestotrotz ist diese Arbeit kostspielig. Um diese Ressource weiterhin zur Verfügung stellen zu können, haben wir Schritte unternommen, um den Missbrauch durch kommerzielle Parteien zu verhindern. Dazu gehören technische Einschränkungen für automatisierte Abfragen.

Wir bitten Sie um Einhaltung folgender Richtlinien:

+ *Nutzung der Dateien zu nichtkommerziellen Zwecken* Wir haben Google Buchsuche für Endanwender konzipiert und möchten, dass Sie diese Dateien nur für persönliche, nichtkommerzielle Zwecke verwenden.

+ *Keine automatisierten Abfragen* Senden Sie keine automatisierten Abfragen irgendwelcher Art an das Google-System. Wenn Sie Recherchen über maschinelle Übersetzung, optische Zeichenerkennung oder andere Bereiche durchführen, in denen der Zugang zu Text in großen Mengen nützlich ist, wenden Sie sich bitte an uns. Wir fördern die Nutzung des öffentlich zugänglichen Materials für diese Zwecke und können Ihnen unter Umständen helfen.

+ *Beibehaltung von Google-Markenelementen* Das "Wasserzeichen" von Google, das Sie in jeder Datei finden, ist wichtig zur Information über dieses Projekt und hilft den Anwendern weiteres Material über Google Buchsuche zu finden. Bitte entfernen Sie das Wasserzeichen nicht.

+ *Bewegen Sie sich innerhalb der Legalität* Unabhängig von Ihrem Verwendungszweck müssen Sie sich Ihrer Verantwortung bewusst sein, sicherzustellen, dass Ihre Nutzung legal ist. Gehen Sie nicht davon aus, dass ein Buch, das nach unserem Dafürhalten für Nutzer in den USA öffentlich zugänglich ist, auch für Nutzer in anderen Ländern öffentlich zugänglich ist. Ob ein Buch noch dem Urheberrecht unterliegt, ist von Land zu Land verschieden. Wir können keine Beratung leisten, ob eine bestimmte Nutzung eines bestimmten Buches gesetzlich zulässig ist. Gehen Sie nicht davon aus, dass das Erscheinen eines Buchs in Google Buchsuche bedeutet, dass es in jeder Form und überall auf der Welt verwendet werden kann. Eine Urheberrechtsverletzung kann schwerwiegende Folgen haben.

Über Google Buchsuche

Das Ziel von Google besteht darin, die weltweiten Informationen zu organisieren und allgemein nutzbar und zugänglich zu machen. Google Buchsuche hilft Lesern dabei, die Bücher dieser Welt zu entdecken, und unterstützt Autoren und Verleger dabei, neue Zielgruppen zu erreichen. Den gesamten Buchtext können Sie im Internet unter `http://books.google.com` durchsuchen.

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com

UNIVERSITY OF VIRGINIA LIBRARY
X030789433

McGraw-Hill Co., Inc.

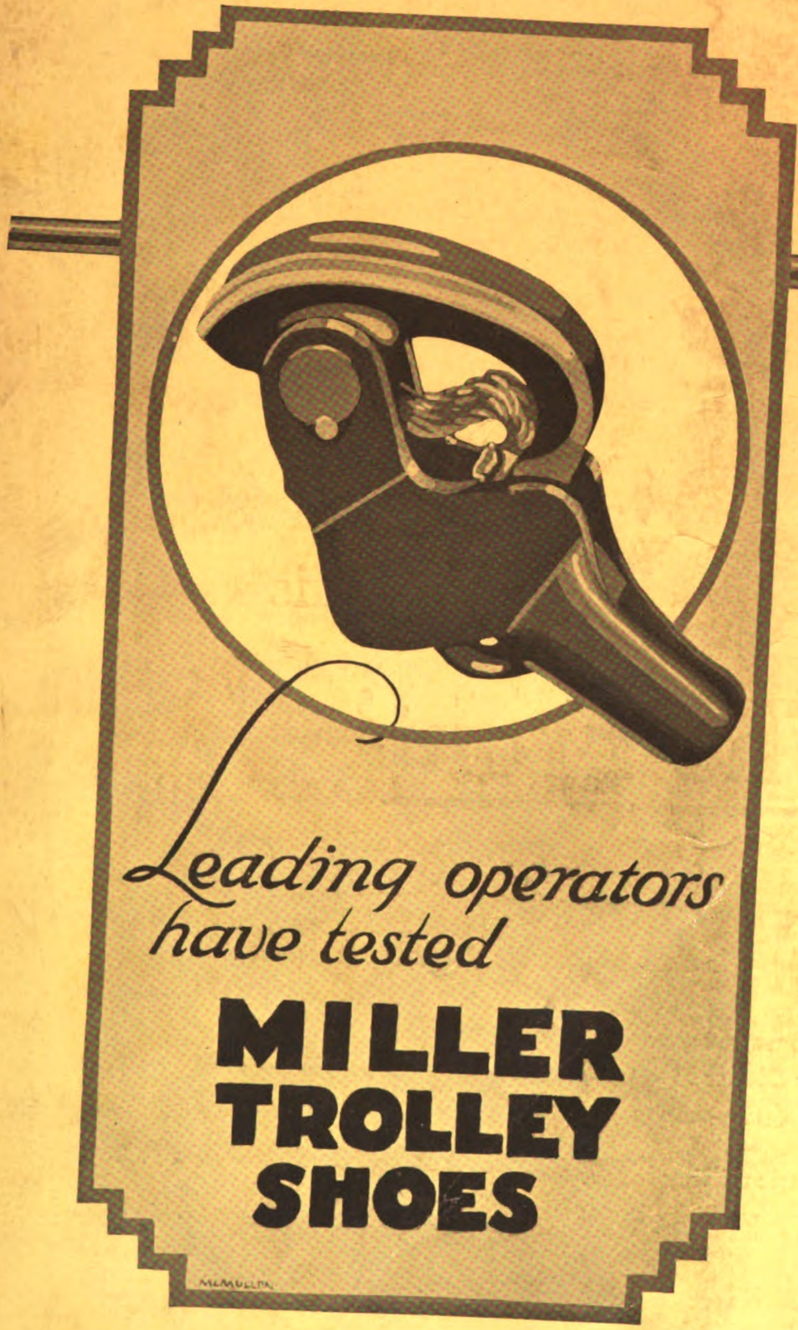
March 1, 1924

Twenty Cents Per Copy

PROPERTY OF
TECHNICAL PUBLICATIONS LIBRARY
U. OF VA. SCHOOL OF ENGINEERING

ELECTRIC RAILWAY JOURNAL

TF
701
.T7



—and they say
"LESS WIRE WEAR"

The 3-inch contact surface of the Miller Shoe glides over wire, ears, frogs and other irregularities smoothly and at any speed. The trolley tension is reduced over one-third. Still it hugs the wire as no wheel ever could; eliminates arcing, pitting, jumping and noise. No wonder wire wear is less!

These claims are backed up by the written testimonials of well-known railway officials, whose experience with Miller Trolley Shoes covers many years of service.

Make your own tests now

MILLER TROLLEY SHOE COMPANY
295 Columbia Road, Boston, Mass.

Western Representative:
Economy Electric Devices Co., 1590 Old Colony Bldg., Chicago, Ill.

Chase Hotel, AERA Headquarters

United Railways Company of St. Louis
No. 510 Motors—35 hp.

The AERA and St. Louis

"To The Front"

It is particularly appropriate at the present time, that the American Electric Railway Association should meet in St. Louis, "The Old City with the New Spirit."

The Electric Railway Industry is showing a new spirit, as evidenced by the following:

1. 282,000,000 dollars have been invested in new equipment.
2. Since the last Mid-Winter Dinner 31 receiverships have been terminated.
3. The Economical one-man, two-man car for train operation has been firmly established.
4. A marked increase of electric railway freight haulage has been made.

The use of the gas bus as an auxiliary service has been materially increased.

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Sales Offices in All Principal Cities of the United States and Foreign Countries

W WESTINGHOUSE ELECTRIC

Westinghouse

Vol. 63, No. 9

New York, March 1, 1924

Pages 319-354

~~Sci. Tech Ctr.~~
TF
701
.E7
v.63
no.9-17
Mar-Apr.
1924

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

MORRIS BUCK
Associate Editor

C. W. SQUIER
Associate Editor

JOHN A. MILLER, JR.
Assistant Editor

G. J. MACMURRAY
News Editor

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago

MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago

CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 319

Semi-Automatic Substation at Concord 321
The 500-kw. unit needs only to be started in the morning. It operates without attention and shuts down automatically at night.

Larger Motor Cars for Zürich 324
An important feature in construction is continued use of aluminum panels. They are used for train service with light-weight trailers.

Important Points in Traffic Control 325
BY J. ROWLAND BIBBINS.
An analysis of four important points in traffic control with their effect on street congestion. Suggestions are made for practical relief.

Telephone Dispatching in San Antonio 323

Interurbans Co-operate with Independent Bus Lines 329

Akron's "Rubber Urge" Passes 330
Street cars resumed operation Feb. 28 under better rate of fare. Full statement of settlement given. Vote on permanent franchise Nov. 1. Entire controversy reviewed, with expressions of opinions by various civic organizations.

Bus Competition Ends at Wheeling 335
Bus competition for interurban runs, begun during the depression of 1921, finally proves unsuccessful and stops. Its effect on traction is analyzed.

Association News and Discussion 337

Insull Proposes Rapid Transit Plan 337
Would build extensions to present elevated system in ten steps and finance through customer ownership plan. Also would have city build subway for "L" through Loop District.

American Association News 338

Steam Railroad Depreciation Charges 338
American Electric Railway Association committee discusses basic questions of useful life and depreciation reserves before the Interstate Commerce Commission.

Maintenance of Equipment 341

News of the Industry 344

Financial and Corporate 347

Traffic and Transportation 349

Legal Notes 350

Personal Mention 351

Manufactures and the Markets 353

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

MEMBER
AERA
1924

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingenieria Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

Copyright, 1924, by McGraw-Hill Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

Is It as Bad as That?

THE editor of a nationally known magazine was recently slapped on the back by an ardent subscriber who told him most enthusiastically that every article and story in his last issue interested him keenly. The editor's comment was, "Great Scott! Was it as bad as that?" for his reaction was that if everything in the paper interested one person there was not the proper variety. This is the true philosophy of magazine building.

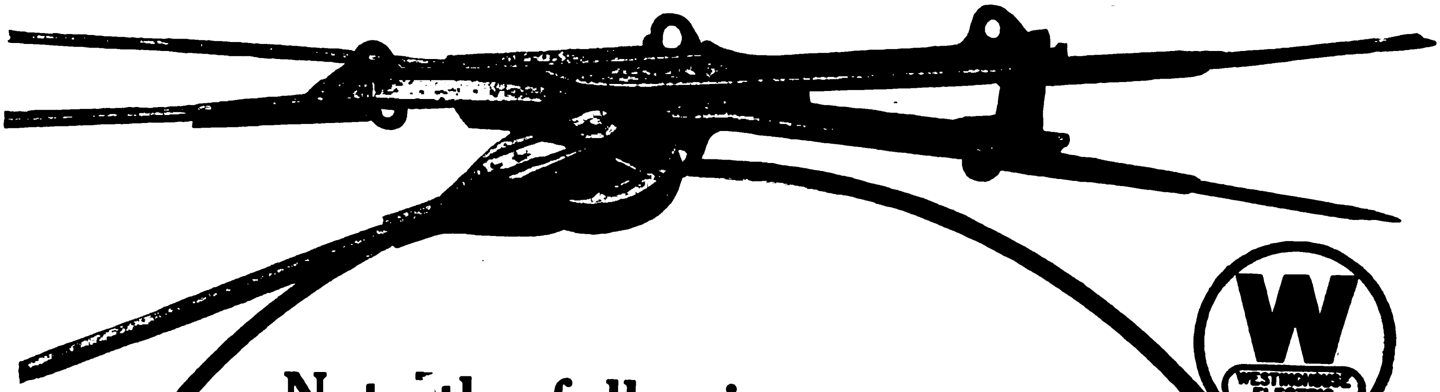
Of course it is not possible to maintain the same "balance" in a paper that presents the news of an industry as it is in a literary magazine. For instance, next week the ELECTRIC RAILWAY JOURNAL will feature a report of the Midyear Meeting of the American Electric Railway Association. This will be the most important news of the week, and as such will be given precedence, even though it disturbs the usual "balance" of material in the issue.

Number of Copies Printed, 6,225

Advertising Index—Alphabetical, 62; Classified, 58, 60; Searchlight Section, 57

A New Trolley Frog

Westinghouse CF with Bayonet Approach



Note the following:

CF Frogs can be installed and replaced without the use of any tool, except a line tool and pliers.

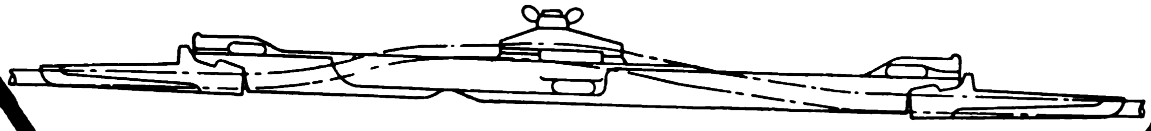
The frog can be placed close enough to the switch-point so as to avoid any trolley-wire wear.

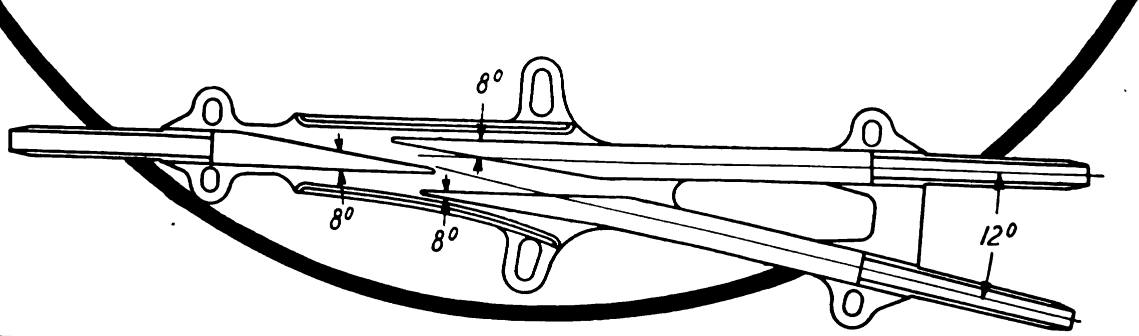
The trolley-wheel contact, during the entire travel, is on the ridges of the frog. This gives longer life to both the frog and the trolley wheel.

The approaches are extra long and flexible, and are quickly installed.

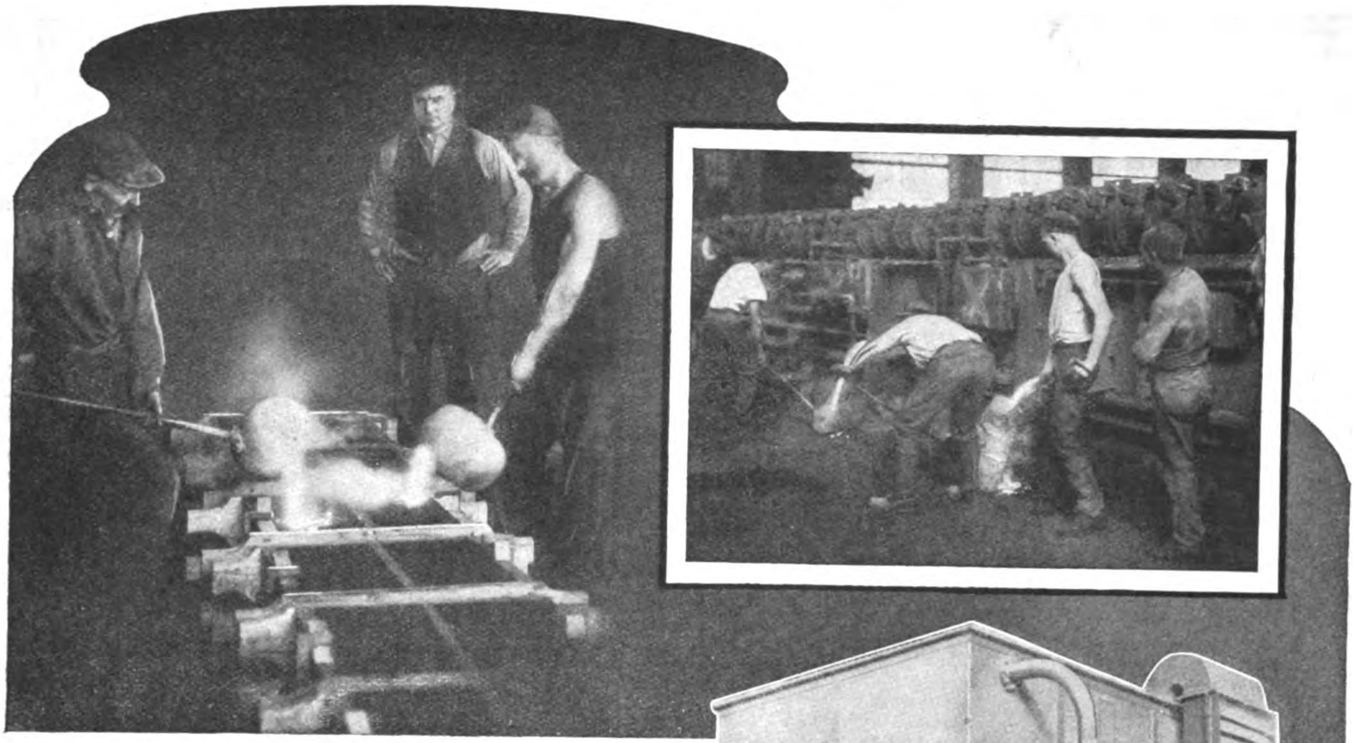
The bridge is low, making the bend in the trolley wire extremely small.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.
Sales Offices in All Principal Cities of the United States and Foreign Countries.





Westinghouse

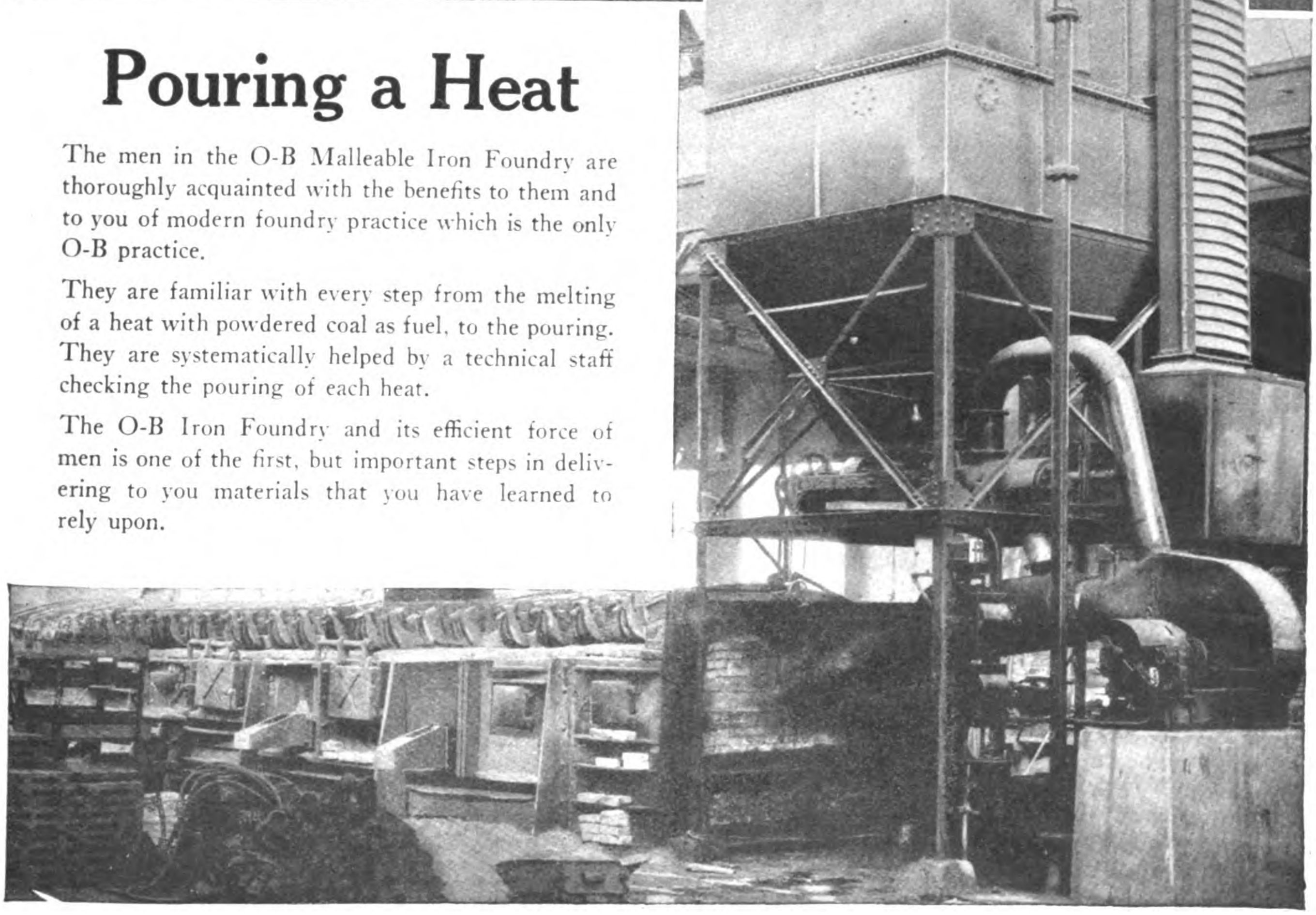


Pouring a Heat

The men in the O-B Malleable Iron Foundry are thoroughly acquainted with the benefits to them and to you of modern foundry practice which is the only O-B practice.

They are familiar with every step from the melting of a heat with powdered coal as fuel, to the pouring. They are systematically helped by a technical staff checking the pouring of each heat.

The O-B Iron Foundry and its efficient force of men is one of the first, but important steps in delivering to you materials that you have learned to rely upon.



O-B Reverbertory Iron Furnace Using Powdered Coal as Fuel

THE OHIO BRASS CO.

Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE

Once Is Not Enough

The *Electric Railway Journal* cannot be expected to run an editorial more than once. But the following, published February 16, deserves more than one appearance. Here it is:

"It Pays To Lay Out Maintenance Work In Advance

It stands to reason that much more can be accomplished by a given expenditure of time and effort when the work is carefully laid out in advance and is conducted along a logical plan of procedure. Sad to relate, this practice is not followed on all electric railway properties. As one maintenance engineer remarked to the writer, "Why worry and waste effort before you know that anything is wrong?"

One large Eastern property followed this haphazard practice for years, and not until it had passed through a receivership and a reorganization was the fallacy of the procedure recognized. Nevertheless, that much can be accomplished along these lines is well shown in the article by Frank B. Walker elsewhere in this issue.

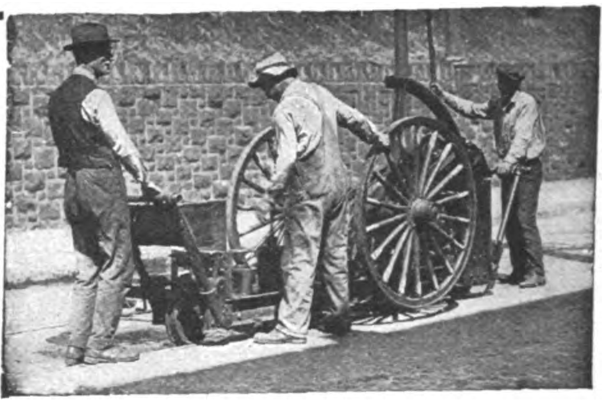
Much of the gain is not from the improved equipment alone, but from the careful planning of the season's work well ahead of time, so that each machine could be in use for the longest period possible, and the men could be kept working steadily. This meant that a smaller amount of equipment had to be purchased and a smaller force hired. With the smaller number of men to train, of course they attained expertness and were able to do more and better work. The gain to the company has been very considerable, not only in cost but in performance, and through that, in improved public esteem."

The property referred to is the Eastern Massachusetts Street Railway. The work laid out was the rehabilitation of 680 miles of track. The equipment used included 9 Ajax Welders, 24 Universal Grinders and 10 Reciprocating Grinders.

Are your plans made? Is your equipment ready? Have you a set of our Bulletins?

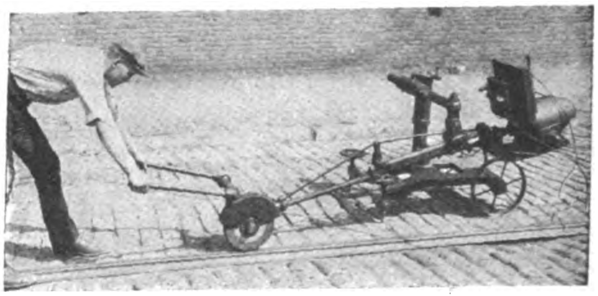
Railway Trackwork Co.
3132-48 East Thompson Street, Philadelphia

AGENTS:
Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co. Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London



"Reciprocating" Track Grinder

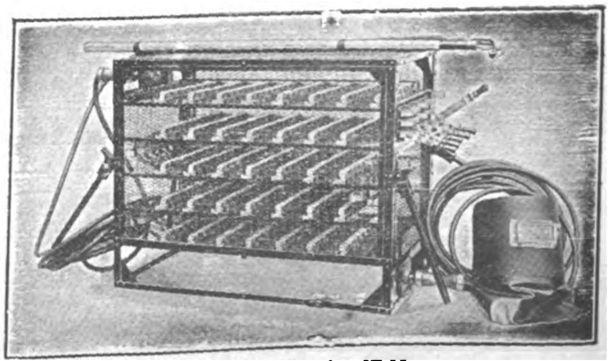
"Universal" Rotary Track Grinder



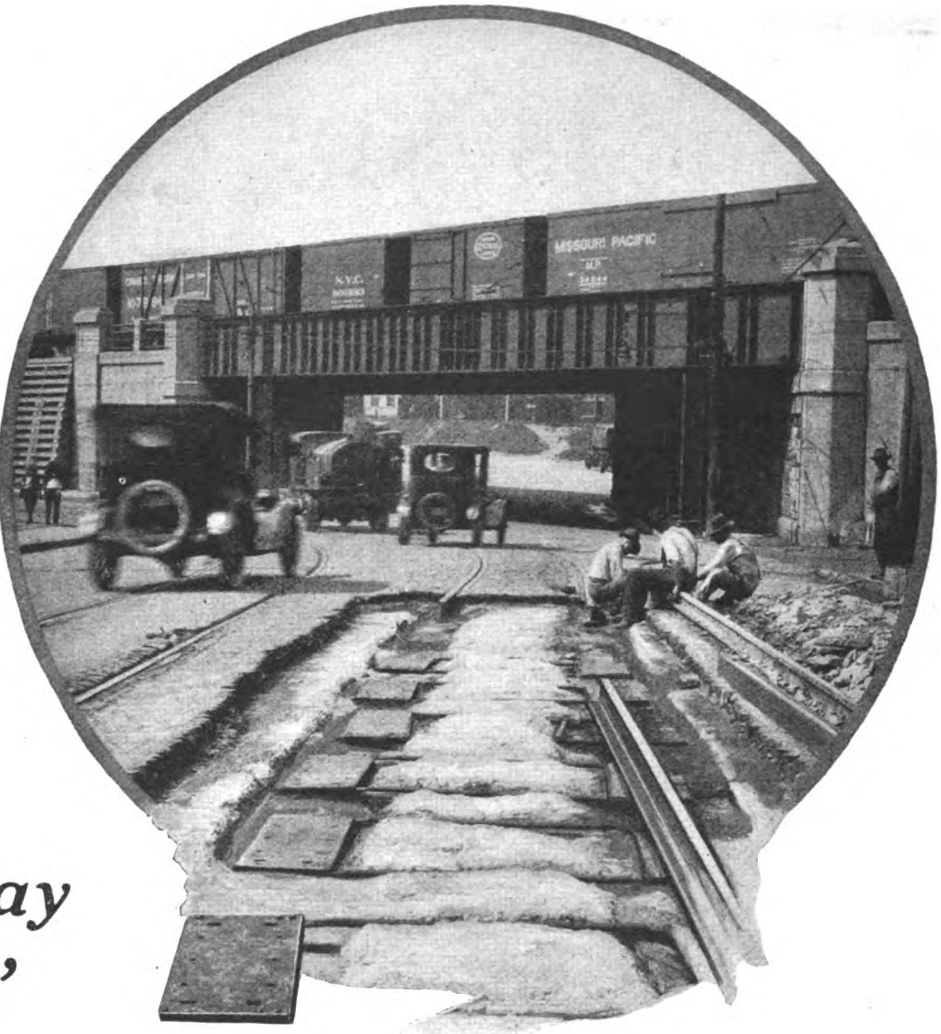
"Hercules" Rail Grinder

ATLAS RAIL GRINDER

"Atlas" Rail Grinder



"Ajax" Electric Arc Welder



When we say 'Renewable' we mean it has been done!

WHILE it might have been possible to predict, or at least safely assert, a few years ago that Twin Tie construction could be renewed, it was not until nearly two years after the first renewal was made that we announced it.

The first job, followed by several others on more important streets, developed the method to a point where we feel secure in standing back of it.

Your paved track construction may now be put in to wear but not to wear out.

Investigate this long life renewable design before you close your 1924 track plans.

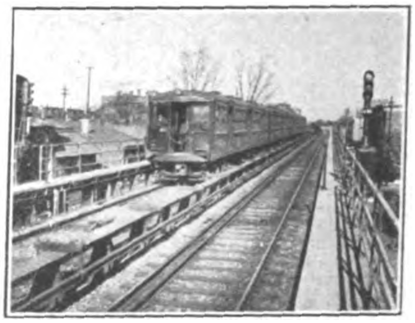
Write for complete information today!

THE INTERNATIONAL STEEL TIE COMPANY
CLEVELAND, OHIO

Steel Twin Tie Track

Illinois Traction Company

Public Service Railroad of New Jersey



Philadelphia Rapid Transit Company

Chicago, Milwaukee & St. Paul Railway

Washington, Baltimore & Annapolis Electric Railroad

Kansas City, Clay County & St. Joseph Railway

Public Confidence

IS ASSURED to Railways equipped with Union Automatic Block Signaling Systems. Return on the investment is secured by the direct and indirect savings produced.

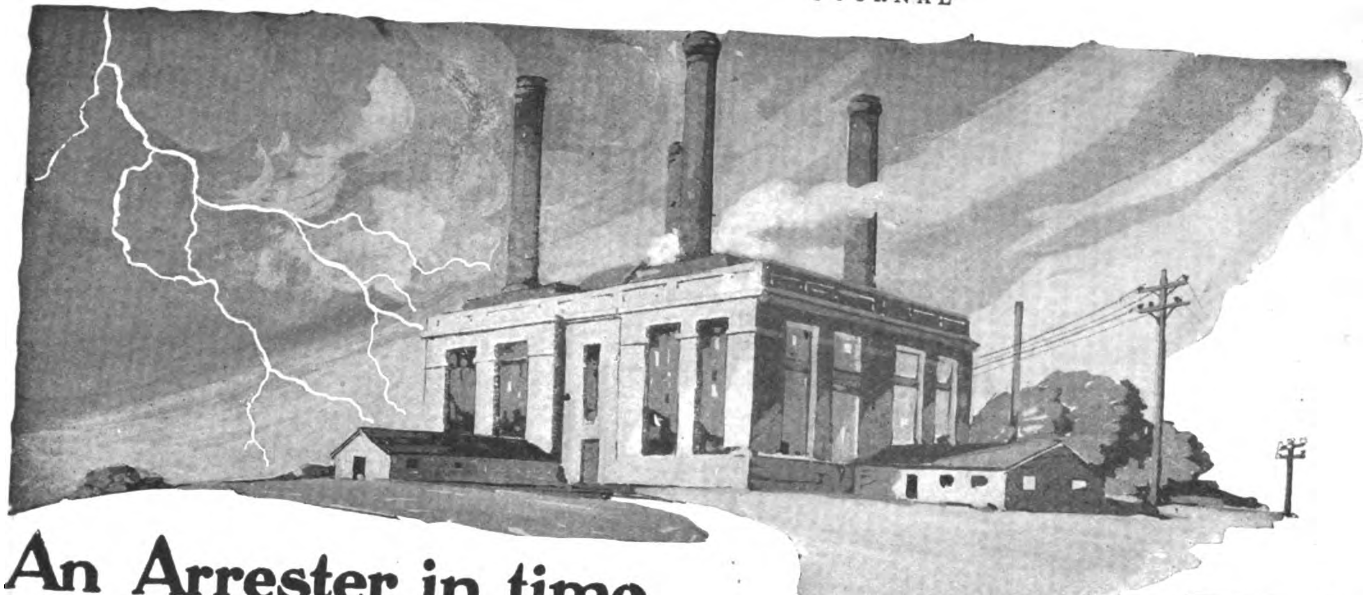
To be Complete—Safe, a signaling system must be based upon the sound principles of the Continuous Track Circuit, or in other words, a means must be provided whereby each car or train is responsible by its mere presence *anywhere* in the block or spacing section to *continuously* maintain one or more opposing stop signals in front of it as well as a stop signal behind it.

Local conditions govern each installation. Let one of our Engineers show you the benefits which Signals will produce for your Railway.

Union Switch & Signal Co.

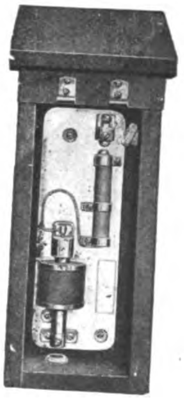
SWISSVALE, PA.

TRADE MARK



An Arrester in time Saves the line —

ORDER NOW!



Garton-Daniels D. C. Pole Arrester Door Removed

Garton-Daniels Arresters

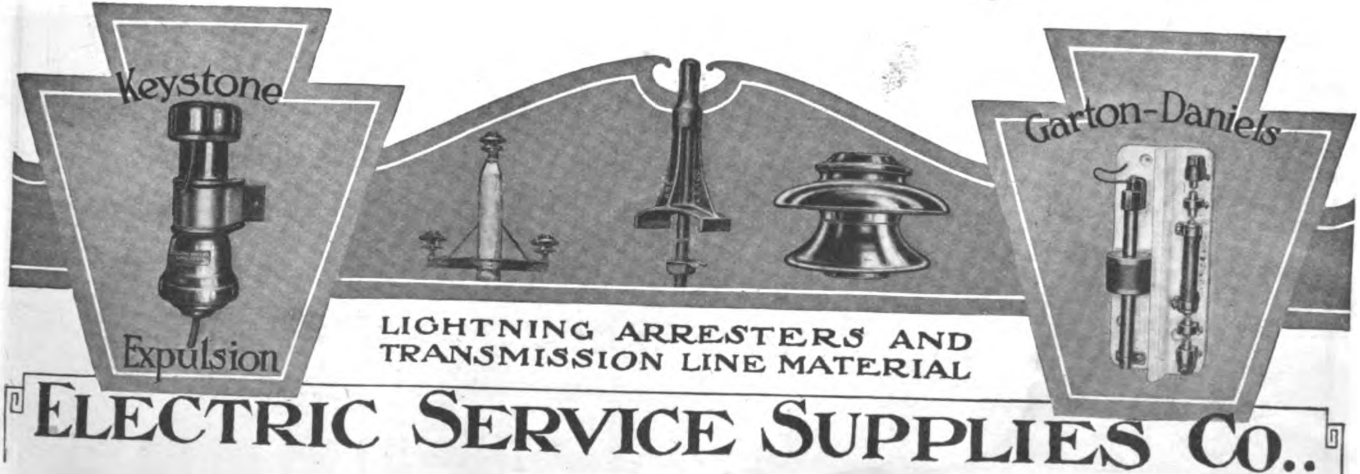
KEYSTONE PRODUCTS

- **Keystone Expulsion Arresters**
- **Garton-Daniels Arresters**
- **Keystone Truss Pins**
- **Locke Insulators**
- **Keystone Triangle Arms**
- **Never-Creep Anchors**
- **Segur Winding Tools**

Time is on your side now. It won't be in a short while, however. Unprotected lines might survive the *first* storm but there's little likelihood of them standing up against storm after storm all through the summer. And the damage then will cost double and treble the cost of protection with the justly famous line of Garton-Daniels Arresters.

Before you order, however, you will want to look over Bulletin 189 on Keystone and Garton-Daniels Lightning Protective Apparatus. It will cost you nothing but a post card.

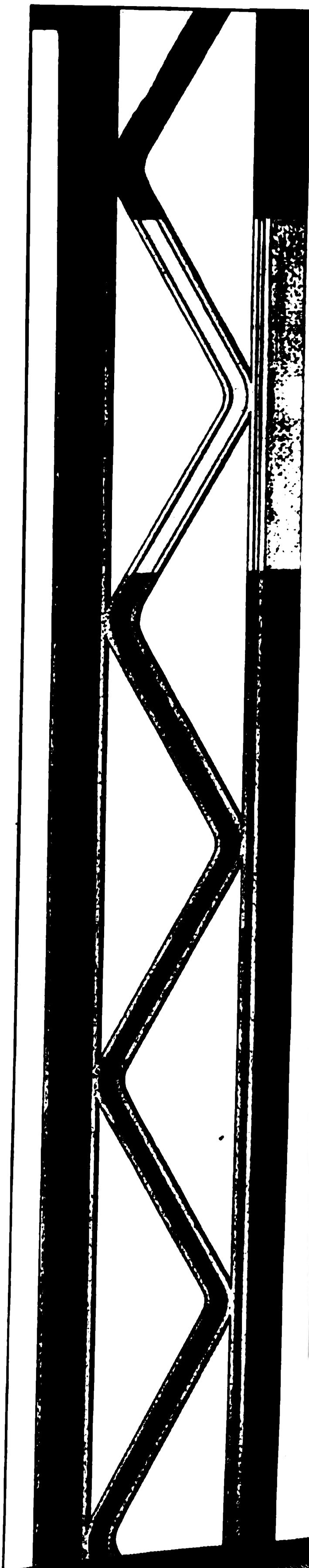
Write for Catalog

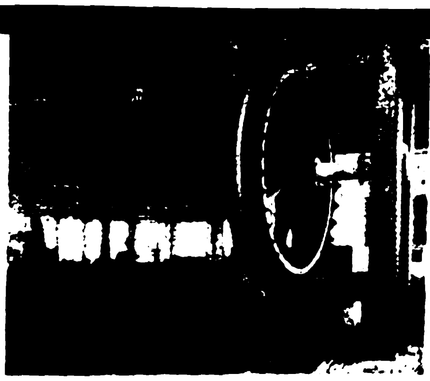


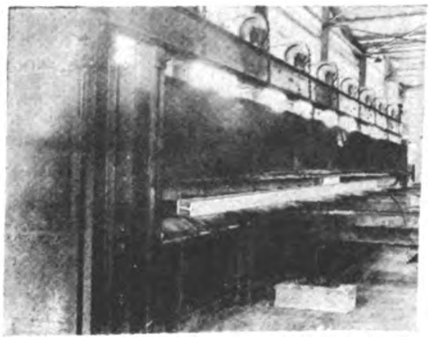
ELECTRIC SERVICE SUPPLIES CO.

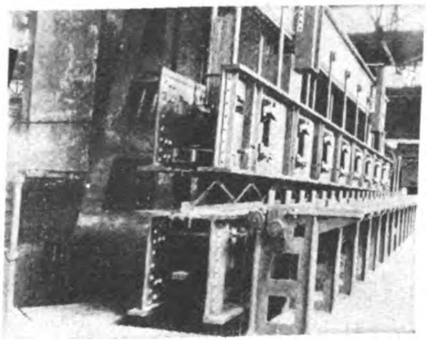
PHILADELPHIA	PITTSBURGH	SCRANTON	NEW YORK	CHICAGO
17th and Cambria Sts.	829 Oliver Bldg.	316 N. Washington Ave.	50 Church St.	Monadnock Bldg.

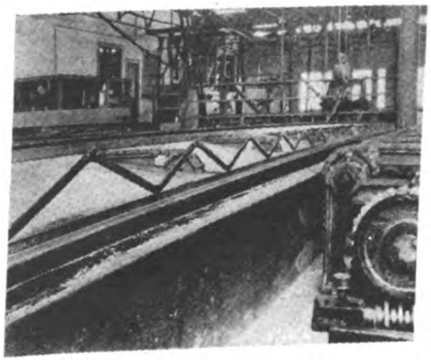
CANADIAN AGENTS: Lyman Tube & Supply Co., Montreal, Toronto, Winnipeg











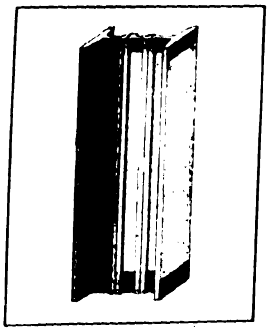
Sheared, Heated, Expanded— Shipped!

Special Rolled Bates "H" sections are sheared (cold) by an enormous rotary shear and charged directly into an oil combustion furnace, and the sheared and heated beams are drawn endwise from the furnace and automatically charged into the expander. The expander grips the flanges and expands the beams. The act of expanding the beams elongates the web portion between the points of unsheared intact, creating, without waste of material, perfect Bates One-Piece Poles.

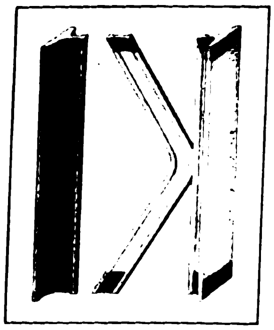
The expanded poles are drawn from the expander onto moving chains, sent through a mechanical straightener, cleaned and painted. The paint is thoroughly dry by the time the pole has become cool and the finished pole is ready for shipment.

Rapid production makes Bates Poles economical in first-cost—their simplicity makes them easy to maintain.

Before Expanded

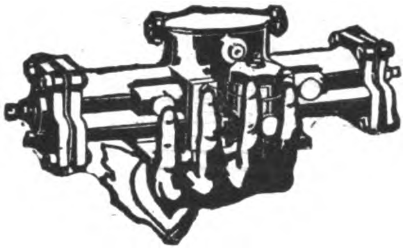


After Expanded



Bates Expanded Steel Truss Co.
Illinois Merchants Bank Bldg.
Chicago, Ill., U. S. A.

BATES ONE PIECE EXPANDED STEEL POLES



Where *you* draw dividends from *our* investment

A properly equipped plant, with ample facilities, and staffed by men trained in their particular job. These, plus years of costly experiment and development, are our investments.

Why not profit by the manufacturing economy and perfection which these assets make possible? Instead of attempting to make your own equipment, in shops already busy with more important maintenance work.

The "home talent" idea has long been proven a fallacy. Buy from a reputable specialist—it pays.

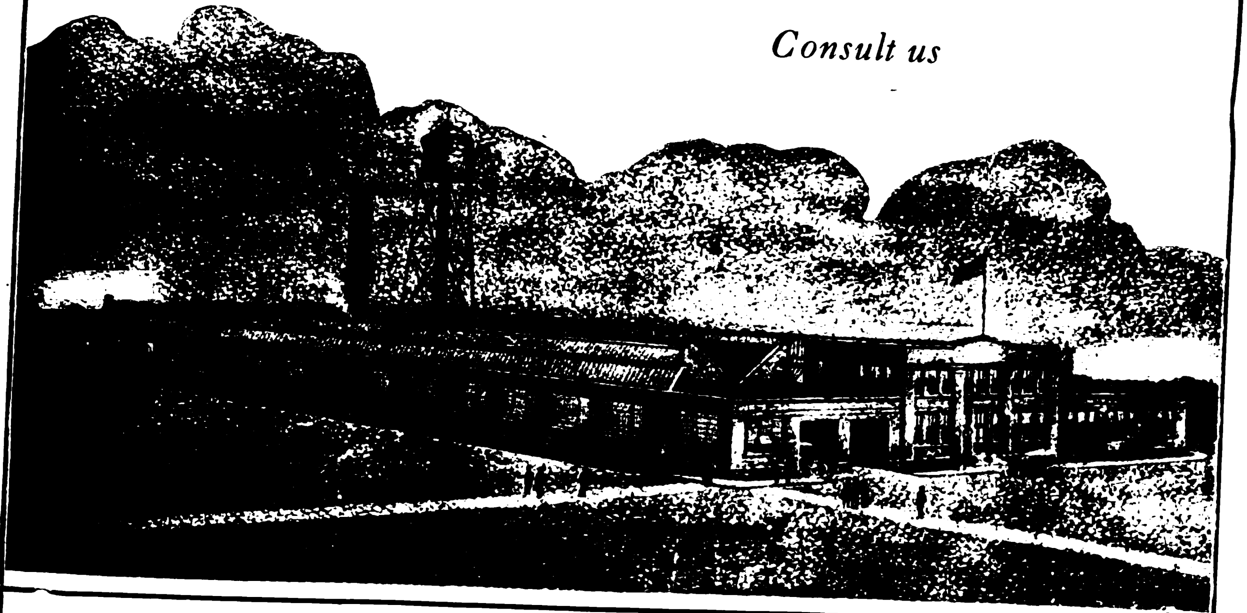
NATIONAL PNEUMATIC EQUIPMENT

DOOR ENGINES

DOOR AND STEP CONTROL

OPERATING MECHANISMS

MOTORMAN'S SIGNAL LIGHTS



Consult us

NATIONAL PNEUMATIC COMPANY, Inc.

50 Church Street, New York
McCormick Bldg., Chicago
Colonial Trust Bldg., Philadelphia
Works: Rahway, N. J.
Dominion Wheel & Foundries, Ltd., Toronto, Ont.

Let Us Get Acquainted

International-ly

YOU are assured in advance of tie satisfaction when you deal with *International*—because all of its ties are manufactured and treated in accordance with the best established standards of the day.

You can depend on *International's* half century of experience in timber preservation.

You can depend on *International's* staff of expert timbermen who supervise its ties through every step of their production.

You can depend on *International's* inspection and grading, because all of its ties are manufactured and marked plainly in strict accordance with the A.R.E.A. specifications.

You can depend on *International's* staff of expert treating engineers who supervise the seasoning and treatment of all of its ties.

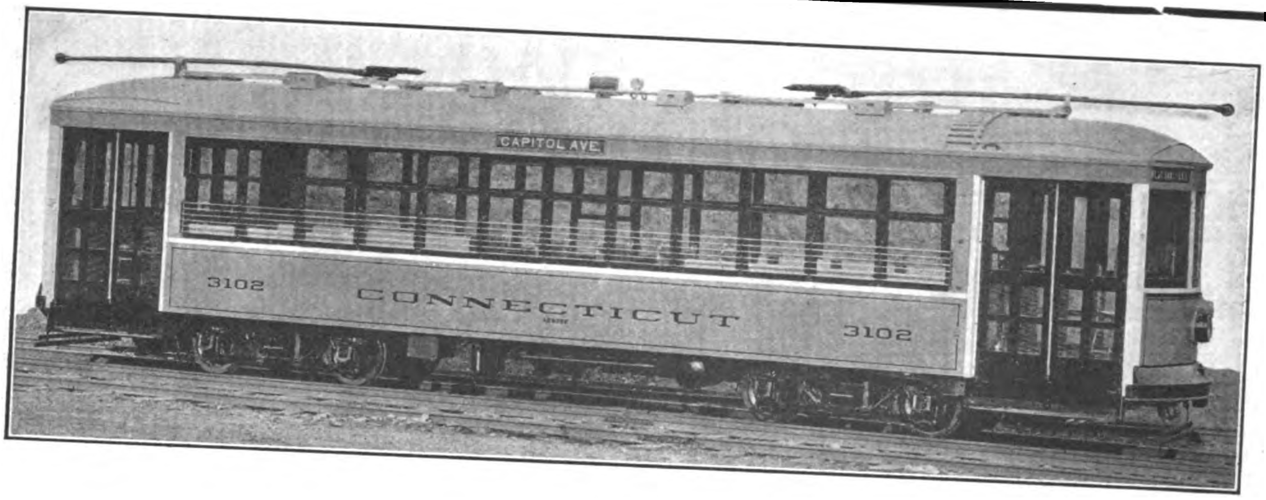
You can depend on *International's* Quality, because it is guaranteed by the *International* Dating Nail which is placed in every tie.

You can depend on *International's* delivery dates, because *International* has served year after year some of the leading railroads in the United States on an annual contract basis and has never failed to fulfill a contract to the satisfaction of its patrons.

The character of *International* Production, Treatment and Service places it high among those prominent organizations known as International Institutions.

Let us get acquainted *Internationally.*

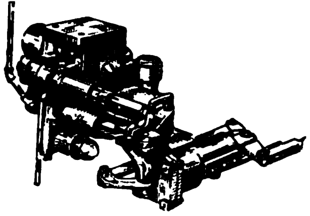
International Creosoting & Construction Co.
General Office—Galveston, Texas
Plant—Texarkana, Texas
Beaumont, Texas Galveston, Texas.



Fifty cars of the type above, recently placed in service on the lines of the Connecticut Co., are equipped with the Variable Load Brake.

Greater Safety; Higher Mileage!

these with the VARIABLE LOAD BRAKE



THE VARIABLE LOAD BRAKE

The Westinghouse Variable Load Brake has been developed to solve the problem of controlling cars under widely varying load conditions. It is an attachment which may be added to any straight air or semi-automatic equipment whereby the braking force is automatically adjusted to suit the weight on the car, by regulating the brake cylinder pressure as the weight changes.

The adjusting mechanism is thrown into engagement by the opening of the car doors. While the doors are open, passengers are leaving and entering the car, and when the doors are closed again, the condition of loading will be that under which brake operation will take place for the next stop, or a slow-down, as the occasion may demand.

The use of the Brake insures stopping within a uniform distance regardless of whether the car is empty or loaded.

Higher daily car mileage in busy territory increases revenue.

The Variable Load Brake helps to increase mileage by reducing the time ordinarily required for stopping, and by making it safe and feasible to operate at peak speed for longer periods from one stop to the next.

The cardinal feature of the Variable Load Brake is that it stops a loaded car in as short a distance as an empty one. It does not slow up schedules during hours of heavy traffic, just when the greatest possible hauling capacity is needed most.

Send for Publication T-2045

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works: WILMERDING, PA.

WESTINGHOUSE TRACTION BRAKES

COLD DRAWN—
TROLLEY POLES

"SHELBY" Seamless Steel Trolley Poles are cold drawn from a selected grade of basic open-hearth steel of about 0.17 per cent carbon, low in phosphorus and sulphur.

"SHELBY" Poles are manufactured by the seamless process—from a solid billet—with no weld or brazed joint to weaken its strength.

"SHELBY" Poles are finished to size and taper desired by cold-drawing.

Prior to the last cold drawing operation, they are given a special heat-treatment which leaves the grain of the steel in the finest condition.

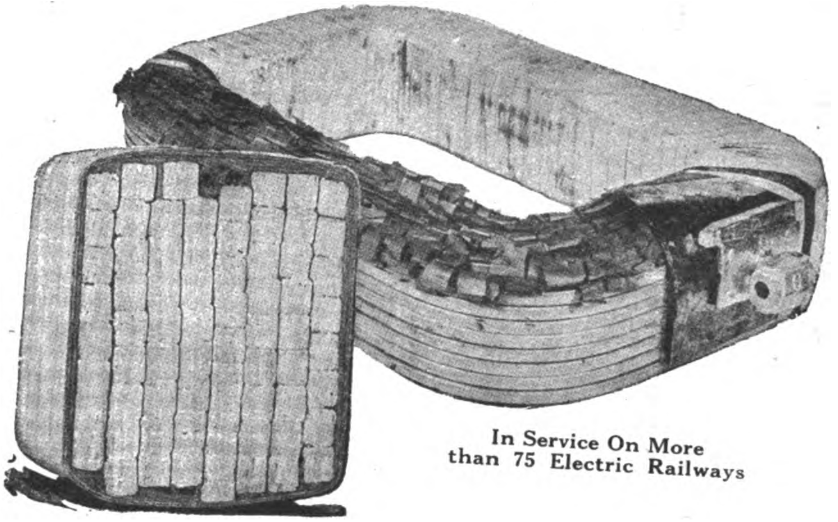
The result is a pole of maximum strength and elasticity with minimum weight.

Perhaps you have never thoroughly looked into the trolley pole question. If not, write us. Our experience, covering many years, is at your command.

*Ask for Booklet, "The 'SHELBY'
Seamless Cold Drawn Steel Trolley Pole"*

NATIONAL TUBE COMPANY
Frick Building, Pittsburgh, Pa.
DISTRICT SALES OFFICES IN THE LARGER CITIES

ALUMINUM COILS



In Service On More than 75 Electric Railways

Here is a partial list of motors for which we have recently built Aluminum Field Coils:

W. H. 12A
W. H. 49
A. C. 1R 50
G. E. 54
G. E. 55
G. E. 57 2 Turn
G. E. 57 3 Turn
G. E. 62A
G. E. 67
W. H. 68
G. E. 70
G. E. 73
G. E. 80
G. E. 88
W. H. 101
W. H. 121
G. E. 216
G. E. 226
G. E. 247
W. H. 310C
W. H. 323
A. C. 1R 501
W. H. 506
G. E. 1000

The permanent insulating qualities of Aluminum Field Coils largely eliminate roasting, shorting and grounding of fields.

The aluminum oxide insulation is an integral part of the conductor which it protects—thus reducing to a minimum the possibility of failure due to moisture.

The use of large square aluminum wire affords the advantage of quick heat conduction to the coil exterior. Hot spots are eliminated and since there is no cotton insulation to char or bake out the coil is little affected by heat.

Aluminum Field Coils have the same number of turns as the coils which they replace.

After being wound they are heated and immersed in an oxidizing solution. Next they are dipped in an insulating varnish, after which they are wrapped with webbing, oiled bias tape and again with webbing. The final treatment is dipping in varnish and baking.

For extreme heat conditions coils are wrapped with asbestos, thus being fireproof.

During the past two years upwards of 2000 of these coils have been put in service, by more than 75 different Companies and many repeat orders have been placed.

Let us quote you prices and answer detailed questions—

Economy Electric Devices Company

L. E. Gould, Pres., Old Colony Bldg., Chicago

Cable Address: Sangamo, Chicago

READ THIS COIL GUARANTEE

WHITAKER · SPECIAL

This Coil, as shipped, is guaranteed against defective material and workmanship. If at any time this coil becomes damaged mechanically or electrically, it will be accepted, f. o. b. Chicago, as 40% of the then purchase price of a duplicate new coil.

ECONOMY ELECTRIC DEVICES CO.
CHICAGO

Reproduction of Guarantee Tag that is attached to every coil shipped

GENERAL SALES AGENTS:
Sangamo Economy Meters
Lind Aluminum Field Coils
DISTRICT AGENTS:
Peter Smith Heaters—Woods Fare Boxes
Bemis Boyerized Truck Specialties
Miller Trolley Shoes

REPRESENTATIVES

Ludwig Hommel & Co., Pittsburgh
Grayson Railway Supply Co., St. Louis
Detroit Railway Supply Co.
Alfred Collyer & Co., Montreal, Quebec
National Railway Appliance Co., New York
L. A. Nott, San Francisco
Burton R. Stare Co., Seattle
Harry G. Holabird Co., Los Angeles

UNA RAIL JOINTS

Continuous—Unchanged Rail Steel

THE rail ends under mutual compression—the gap between rail ends eliminated—the car wheels passing from rail to rail without impact, without the possibility of the cold flow of metal into the gap; that's the fundamental principle of the mechanical set-up of the UNA Joint.

Then the welding to maintain the mechanical structure and to supply the necessary 100% electrical characteristics.

In the UNA Welding Process no excessive heat is applied to the running surface of the rail—the same original steel structure remains throughout the rail—no more wear at the joint than at any other part of the rail—a joint with the life of the rail itself.

The UNA Joint is easily intalled at a low cost—it can be used in either new or old track—there is no traffic delay—the welding apparatus is easily portable and serves efficiently for all general welding and bonding. The UNA Joint meets the needs of both small and large properties.

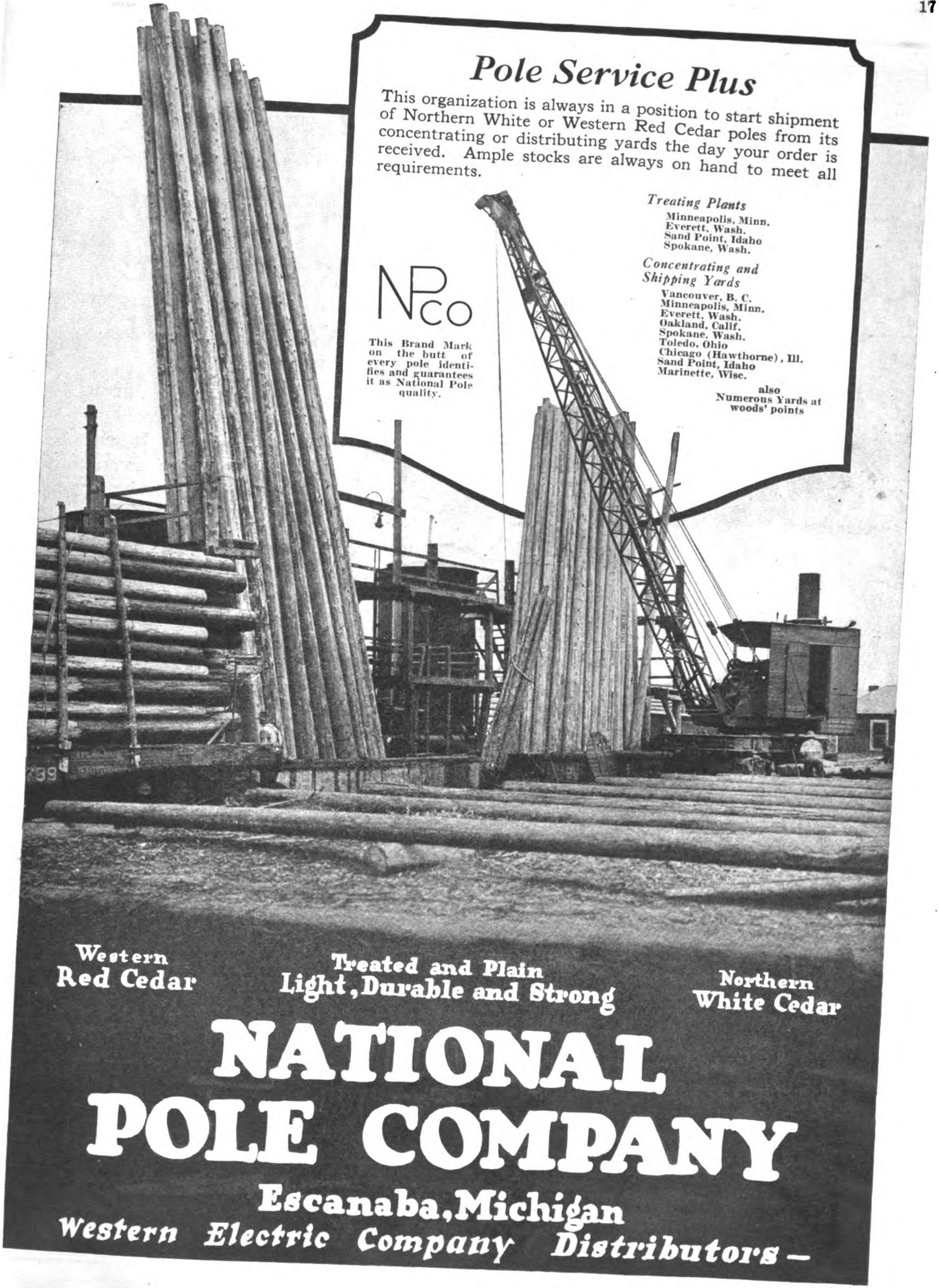
Ease of installation and low cost apply equally well to the small property with a limited number of joints as well as to the large property with hundreds of joints.

"Investigations of Seam Welded Rail Joints" is the title of a bulletin which covers in detail the development and testing program back of the UNA Joint. Such topics as the stresses and strains, the proper mechanical set-up and welding of the rail joint are discussed. Have you received your copy?

Rail Welding and Bonding Co., Cleveland, Ohio

Manufacturers of

UNA RAIL BONDS



Pole Service Plus

This organization is always in a position to start shipment of Northern White or Western Red Cedar poles from its concentrating or distributing yards the day your order is received. Ample stocks are always on hand to meet all requirements.

NPCO

This Brand Mark on the butt of every pole identifies and guarantees it as National Pole quality.

Treating Plants

Minneapolis, Minn.
Everett, Wash.
Sand Point, Idaho
Spokane, Wash.

Concentrating and Shipping Yards

Vancouver, B. C.
Minneapolis, Minn.
Everett, Wash.
Oakland, Calif.
Spokane, Wash.
Toledo, Ohio
Chicago (Hawthorne), Ill.
Sand Point, Idaho
Marinette, Wisc.

also Numerous Yards at woods' points

Western Red Cedar

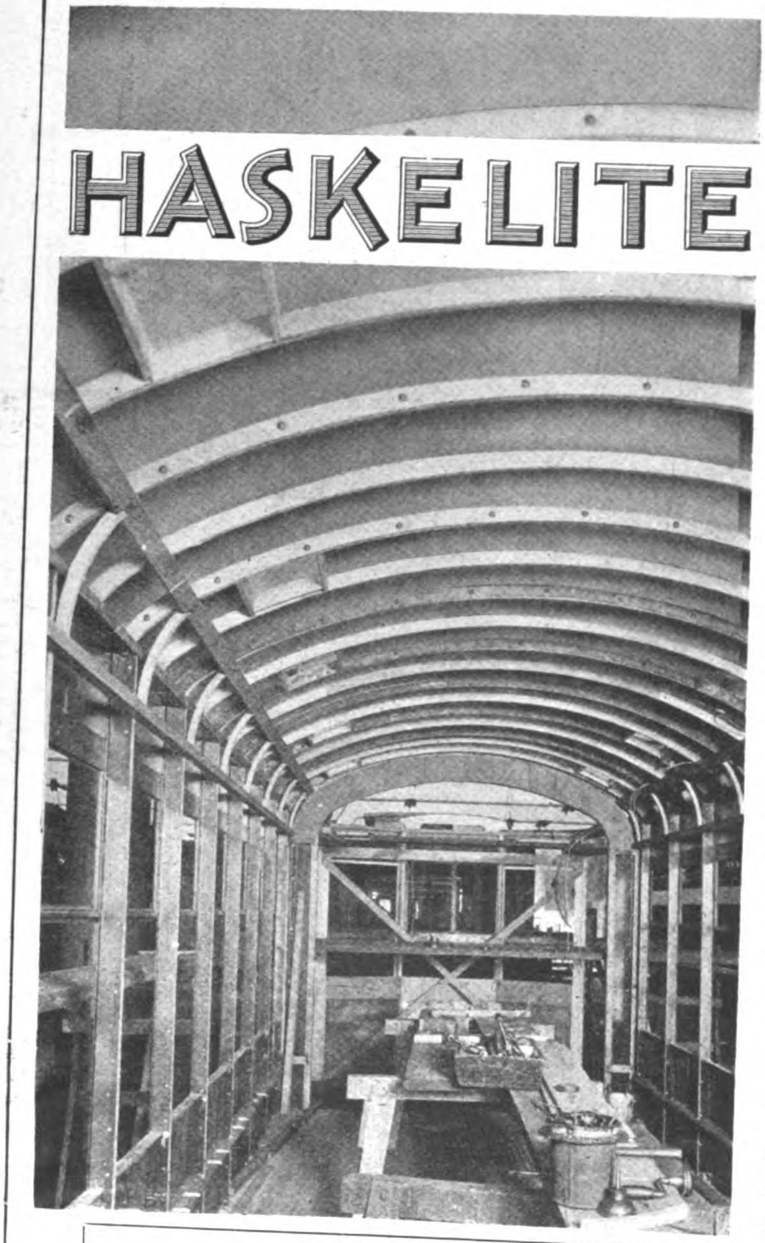
Treated and Plain
Light, Durable and Strong

Northern White Cedar

NATIONAL POLE COMPANY

Escanaba, Michigan

Western Electric Company Distributors—

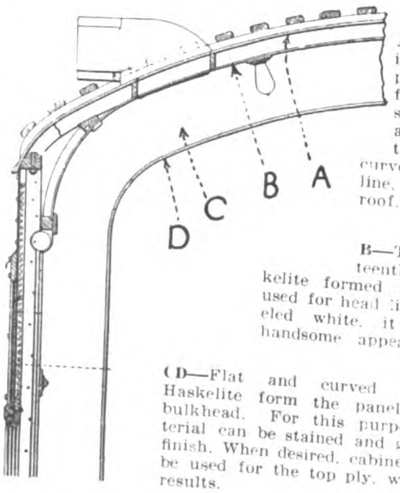


HASKELITE

Car Roofs of HASKELITE are 30% lighter, with no sacrifice of strength

Combining lightness with great strength it is especially adapted to use on roofs and linings. It will easily support the weight of several men, with no danger of leaks or breakage. It can be applied in three to five sections, moulded to the proper shape, thus saving at least 50% in labor of placing. Joints in the roof are reduced in number, with corresponding reduction in possible leaks. In a lighter weight, it is admirably adapted to use as head linings. Its surface takes high finish very easily and either in the natural wood or enamel it adds much to the attractiveness of the car interior. Climate, moisture and temperature do not effect it, and it presents greater resistance to indentation or rupture than solid wood or other ply material.

Plymetl, which is Haskelite with a steel surface, is gaining favor as a material for side panels on cars and buses. It, like Haskelite is easily worked, is enduring and possesses great strength. Send today for complete data on the application and properties of this interesting material.

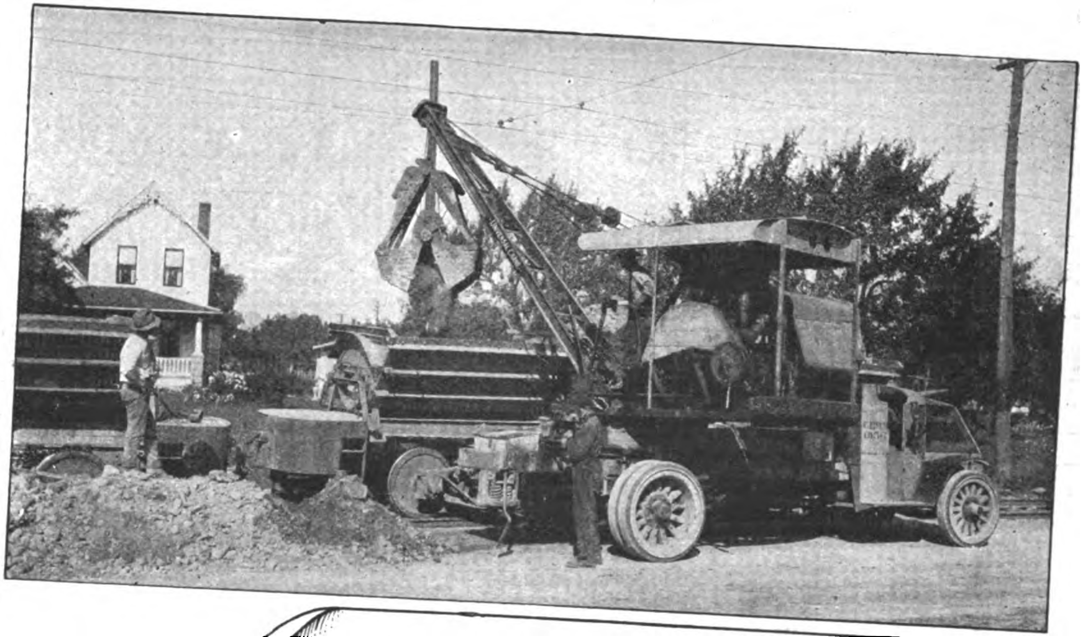


A—Quarter inch Haskelite panels steam formed to the shorter radius, and sprung to the larger curve of the car-line, forms the roof.

B—Three-Sixteenth-inch Haskelite formed and bent, is used for head linings. Enameled white, it presents a handsome appearance.

CD—Flat and curved surfaces of Haskelite form the panelling on the bulkhead. For this purpose the material can be stained and given a high finish. When desired, cabinet woods can be used for the top ply, with excellent results.

HASKELITE MANUFACTURING CORPORATION
Chamber of Commerce Building, CHICAGO, ILL.



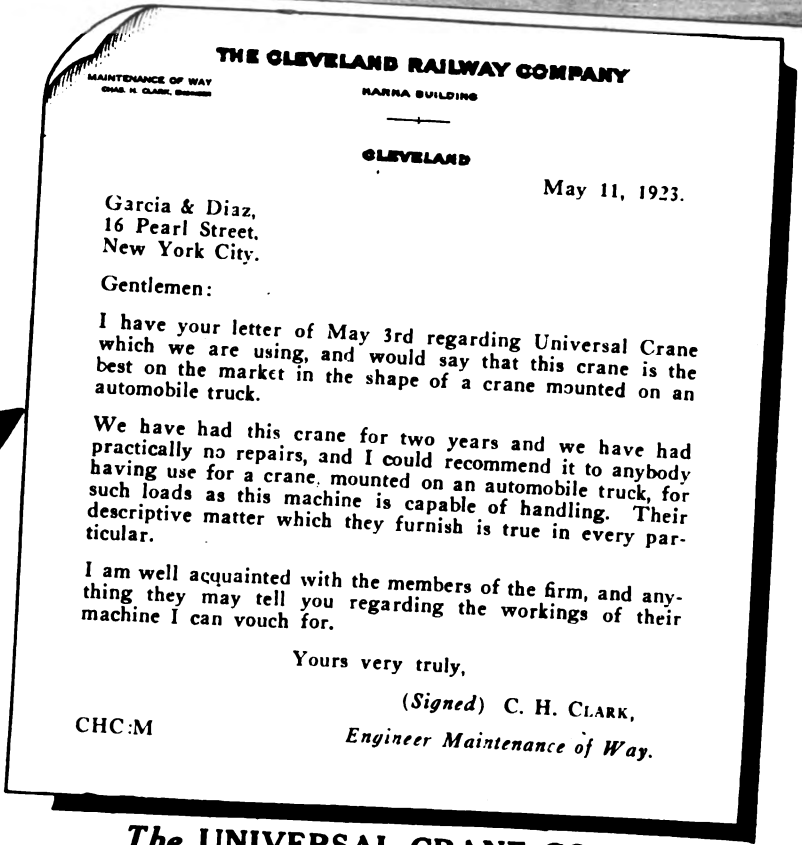
Street Railway Officials

!

READ THIS

Garcia & Diaz asked the Cleveland Railway Company what they thought of the Universal Crane. Here is their answer.

Every street railway in the country can save money on construction and repair work by using these motor truck mounted cranes. Let us explain. Write for Bulletin 22-J.



THE CLEVELAND RAILWAY COMPANY

MAINTENANCE OF WAY
CHAS. H. CLARK, ENGINEER

HANNA BUILDING

CLEVELAND

May 11, 1923.

Garcia & Diaz,
16 Pearl Street.
New York City.

Gentlemen:

I have your letter of May 3rd regarding Universal Crane which we are using, and would say that this crane is the best on the market in the shape of a crane mounted on an automobile truck.

We have had this crane for two years and we have had practically no repairs, and I could recommend it to anybody having use for a crane, mounted on an automobile truck, for such loads as this machine is capable of handling. Their descriptive matter which they furnish is true in every particular.

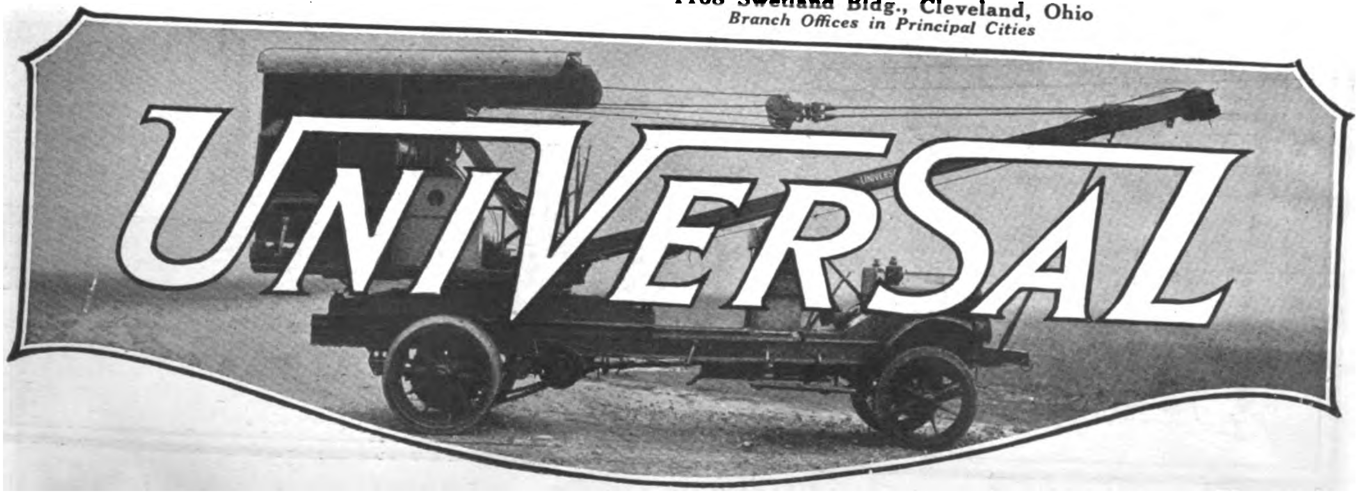
I am well acquainted with the members of the firm, and anything they may tell you regarding the workings of their machine I can vouch for.

Yours very truly,

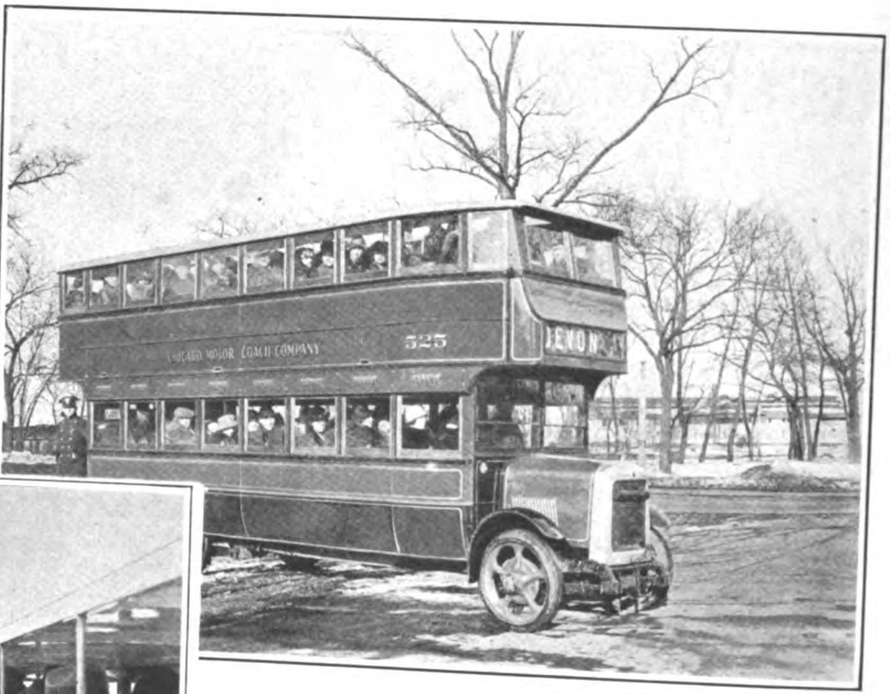
(*Signed*) C. H. CLARK,
Engineer Maintenance of Way.

CHC:M

The **UNIVERSAL CRANE CO.**
1168 Swetland Bldg., Cleveland, Ohio
Branch Offices in Principal Cities



YELLOW COACH MFG CO
CHICAGO



YELLOW

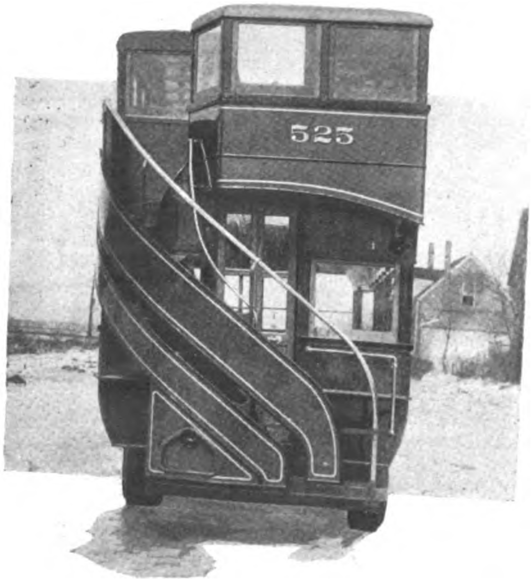
Built to

All successful merchandising is based on furnishing goods for which there is a definite demand. Transportation is no exception, as every electric railway man well knows.

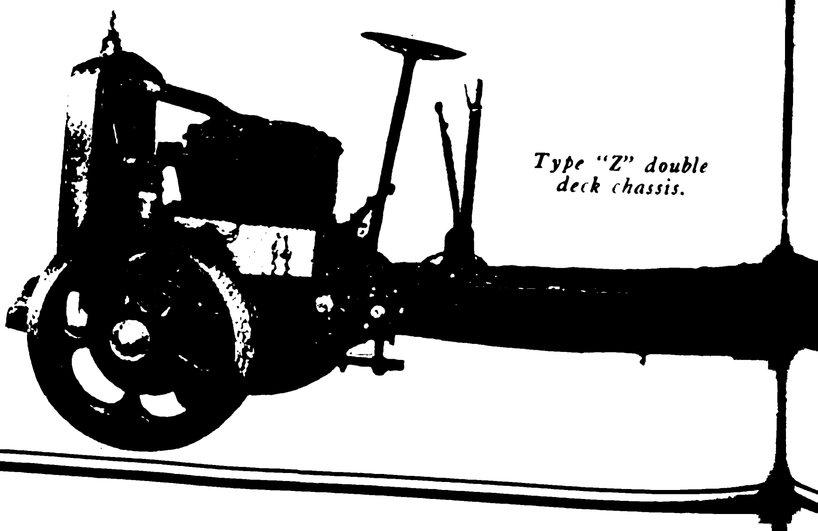
In the successful operation of coaches to supplement electric railway service, passenger comfort, passenger safety and passenger convenience are of prime importance if public favor is to be gained and held. In addition to these qualifications, the design must be such that there will be minimum maintenance cost. These characteristics must be inherent in the coach.

All of these things are achieved as a result of designing, manufacturing and operating experience for which there is no substitute.

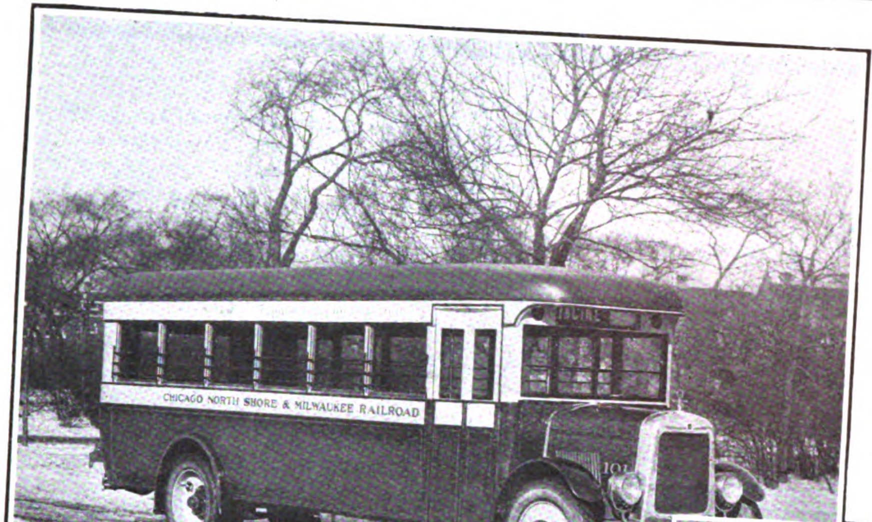
Every detail of Yellow Coach design and construction has been carefully worked out with these essentials in mind. No detail has been omitted which might in some manner enhance public goodwill. Low level wide doorways, generous platforms and their convenient arrangement make for easy entrance and exit; comfortable seats and scientifically designed springs guarantee maximum riding qualities.



These three photographs show the Detroit type "Z," 67 passenger double deck coach with semi-enclosed top. This feature is of tremendous importance, the arrangement being such that top deck passsengers have all the advantages of a full enclosure with none of the drawbacks.

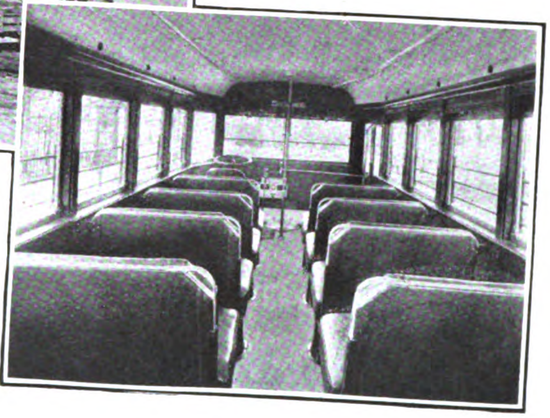


Type "Z" double deck chassis.



Here is one of our Yellow Coach models particularly adapted to heavy duty service. There is comfortable seating accommodation for twenty-nine persons. Note the clear view for both driver and passengers. The inside finish is luxurious and the illumination ample. The cushions are deep. There is plenty of leg room.

Extreme care has been taken to obtain the simplest possible electrical control system. The dash cabinet contains all switches, fuses, spare fuses, voltage regulator, reverse current cut-out, ammeter, pilot light, speedometer, clock and oil gauge.



W COACH

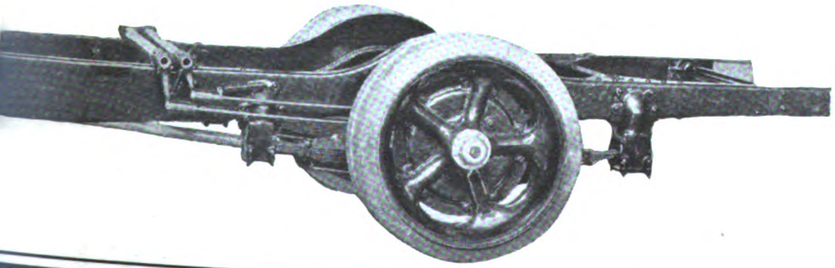
lt t Sell Rides

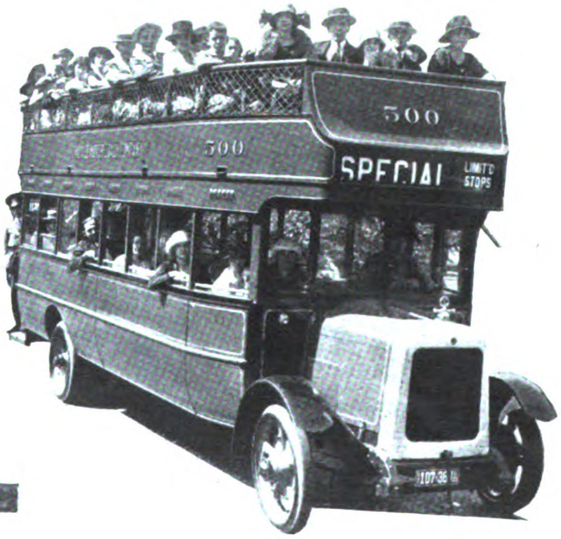
Some Recent Orders:

Philadelphia Rural Transit Company
Public Service Railway Company
Detroit Motor Bus Company
People's Motorbus Company, St. Louis
Milwaukee Electric Railway & Light Company
Chicago, North Shore & Milwaukee R.R. Company
Houston Electric Company
The Connecticut Company
Chicago Motor Coach Company

The Yellow Coach Manufacturing Company will gladly supply full details regarding construction, maintenance, etc. It not only designs and manufactures Yellow Coaches but lends active assistance in establishing the most profitable operating system in existence.

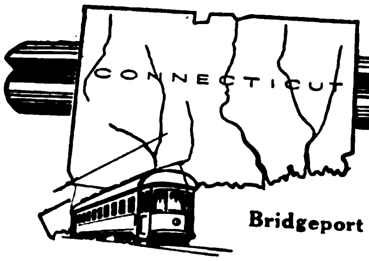
YELLOW COACH MANUFACTURING CO.
Austin and Dickens Aves., CHICAGO





67-passenger double deck Yellow Coach now being built in large numbers for metropolitan service.

A helpful service to the electric railway industry is located at Bridgeport



Giving the trolley a chance in Philadelphia

Under the direction of Gen. S. D. Butler, Philadelphia's new Director of Safety, the intolerable rush hour congestion prevalent during the last few years is rapidly being relieved.

Exclusion of motor cars from certain streets and establishment of ample safety zones on other thoroughfares coupled with enforcement of laws hitherto dormant has resulted in faster travel time for both motorists and car riders.

Thirty-two years ago, when such congested conditions were undreamed of, Philadelphia's first electric car drew its current from Phono-Electric Wire. The first installation was 6 miles long. Starting on an 8 to 10-minute daytime headway, this wire lasted 21 years. Through all the intervening years of increasing traffic, Philadelphians have ridden under Phono-Electric Wire.

It has never gone back on the record set by the six miles first installed.

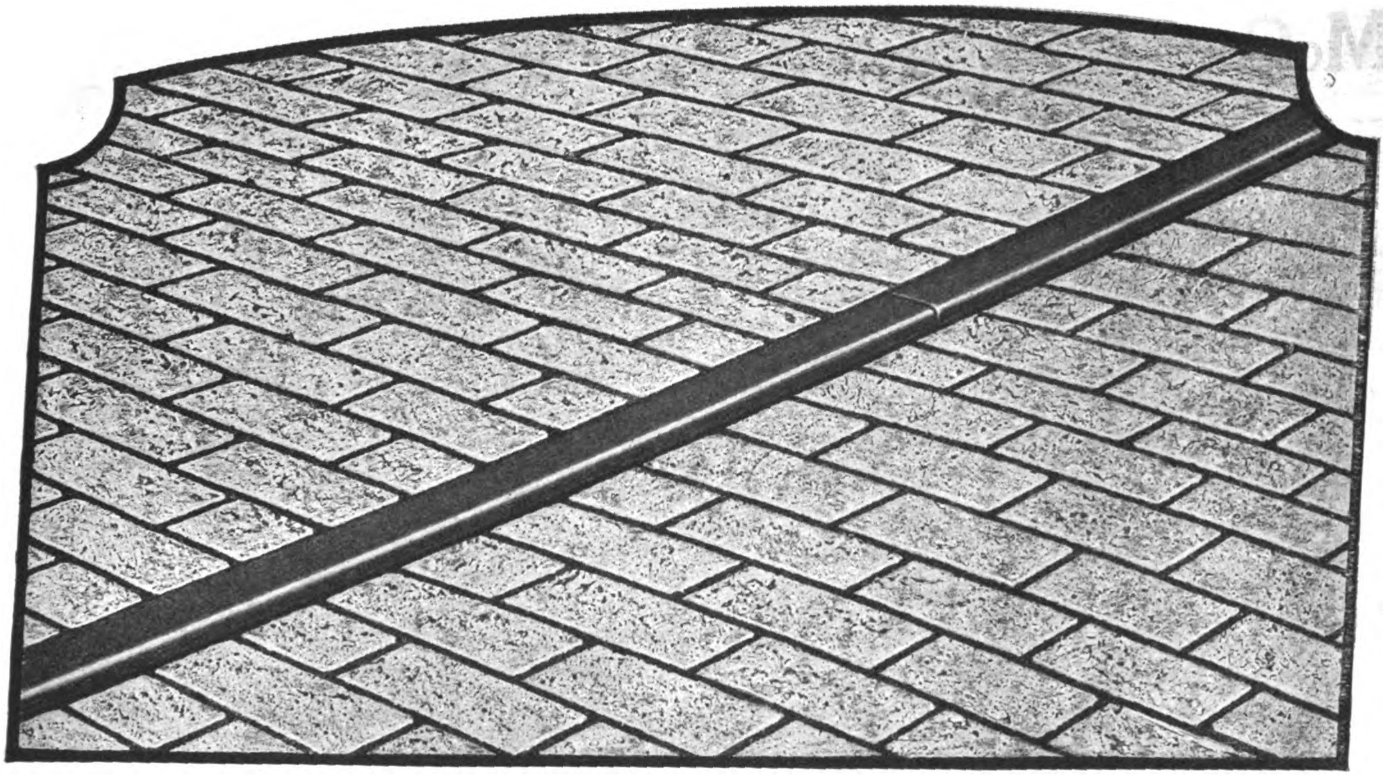
"Bridgeport" TRADE BRASS CO. MARK
Phono-Electric

Members of the Copper and Brass Association.

A. E. R. A. Delegates notice!

Such records as the above of Phono-Electric service and durability in Philadelphia are being set in every city where trolleys are operated by progressive companies. St. Louis—the A.E.R.A. Mid-Year-meeting city is another served by Phono-Electric.

Bridgeport
Brass Company
BRIDGEPORT - CONNECTICUT
DENCKLA BUILDING
32



WATER-TIGHT

—yet quickly removable

VITRIFIED paving brick with asphalt filler makes the ideal modern pavement in electric railway service.

The asphalt filler seals the joints and helps to form a water-tight surface which is not cracked by impact, expansion or contraction—no water seeps down to ties and cross-rods.

And when the need comes to replace a rail, a tie or a section of track, the individual bricks are readily removed and as easily relaid with 100% salvage value.

VITRIFIED
Brick
PAVEMENTS
OUTLAST THE BONDS

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION, ENGINEERS BLDG., CLEVELAND, OHIO

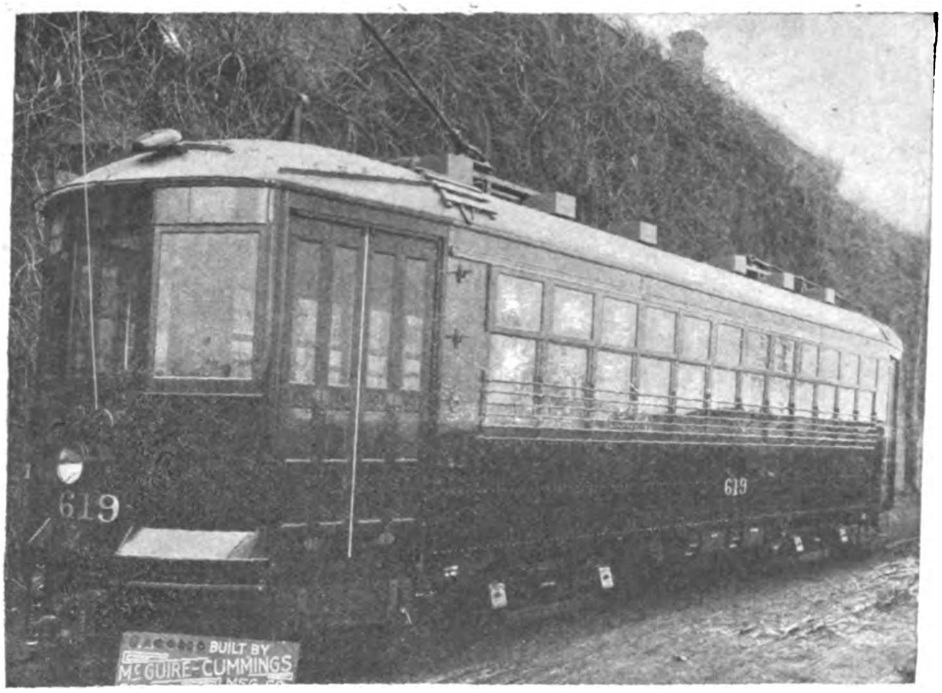
Albion Shale Brick Company
Albion, Ill.
Alton Brick Company
Alton Ill.
Barr Clay Company
Streator, Ill.
Binghamton Brick Company
Binghamton, N. Y.
Cleveland Brick & Clay Company
Cleveland. Ohio
Clydesdale Brick & Stone Co.
Pittsburgh, Pa.
Coffeyville Vitrified Brick & Tile Co.
Coffeyville Kans.
Collinwood Shale Brick Company
Cleveland, Ohio
Corry Brick & Tile Company
Corry, Pa.
Francis Vitric Brick Company
Boynton, Okla.

Georgia Vitrified Brick & Clay Co.
Augusta, Ga.
Globe Brick Company
East Liverpool, Ohio.
Hammond Fire Brick Company
Fairmont W. Va.
Hocking Valley Brick Company
Columbus, Ohio.
Independence Paving Brick Co.
Independence, Kans.
Mack Mfg. Company
Wheeling, W. Va.
C. P. Mayer Brick Company
Bridgeville, Pa.
Medal Paving Brick Company
Cleveland, Ohio.
Metropolis Paving Brick Co.
Pittsburg, Kansas.

Metropolitan Paving Brick Co.
Canton, Ohio.
Mineral Wells Paving Brick Co.
Mineral Wells, Texas.
Moberly Paving Brick Company
Moberly, Mo.
Murphysboro Paving Brick Co.
Murphysboro, Ill.
Patton Clay Mfg. Company
Patton, Pa.
Peebles Paving Brick Company
Portsmouth, Ohio
Pittsburgh Paving Brick Company
Pittsburgh Kansas.
Purington Paving Brick Company
Galesburg, Ill.
Southern Clay Mfg. Company
Chattanooga, Tenn.
Springfield Paving Brick Company
Springfield. Ill.

Sterling Brick Company
Olean, N. Y.
Streator Clay Mfg. Company
Streator, Ill.
Thornton Fire Brick Company
Clarksburg, W. Va.
Thurber Brick Company
Ft. Worth, Texas.
Toronto Fire Clay Company
Toronto, Ohio
Trinidad Brick & Tile Company
Trinidad, Colo.
Veedersburg Paver Company
Veedersburg, Ind.
Western Shale Products Company
Fort Scott, Kans.
Westport Paving Brick Company
Baltimore, Md.

McGuire-Cummings Manufacturing Co.



Multiple-unit-control double-truck passenger car for two-man operation—Built for Georgia Ry. & Power Co., Atlanta.

The above shows type of cars built for the Georgia Railway & Power Co. of Atlanta. Succeeding advertisements will feature cars of the following types recently built by us.

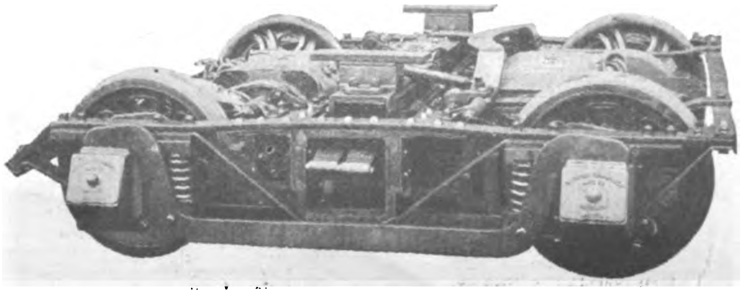
1. **Light-weight, Double-truck Cars**
   One-man-two-man operation. Built for Des Moines City Railway Co., Des Moines, Iowa.
2. **Safety Cars for One-man Operation**
   With double doors. Built for Gary Street Railway Co., Gary, Ind.
3. **Center Entrance Cars**
   (Peter Witt type.)
   Built for the City of Detroit.
4. **Light-weight Suburban Cars**
   Built for Chicago & West Towns Railway Co.

Our engineering department is at your service. We will be pleased to either submit specifications and drawings and to quote prices thereon, or we will submit proposals on specifications furnished.

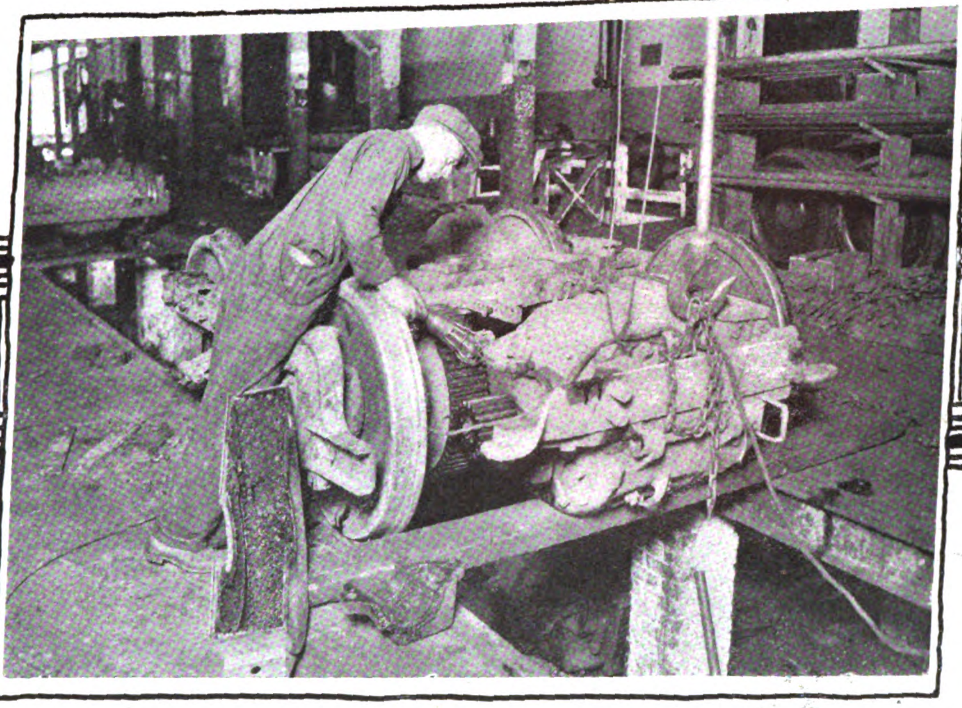
McGuire-Cummings Manufacturing Co.

General Offices
111 W. Monroe St., CHICAGO, Ill.

McGuire-Cummings No. 62 motor truck for low car body for city service



Inside hung brake equalizer design, 26-inch wheels



Look into Your Lubrication Costs

The difference in the first cost of Galena Guaranteed Lubricants and the ordinary Refinery products is a very small item—amounting probably to not more than one-tenth of one per cent in the annual maintenance costs.

But the difference in service results secured is a large and important one, as it is a positive factor in determining the amount of other maintenance expenses that greatly exceed the cost of lubricants.

The low co-efficient of friction in Galena Oils is a quality that alone produces a saving in power or fuel costs far greater than this price difference. The reduction of journal and bearing troubles, labor, time losses and depreciation are others that prove their ultimate economy.

The formal recording of the purchase price of oil is by no means a record of lubrication costs. When cars are shopped, time lost, or labor required to correct conditions plainly due to lubrication trouble, charge the expense to its proper account—LUBRICATION.

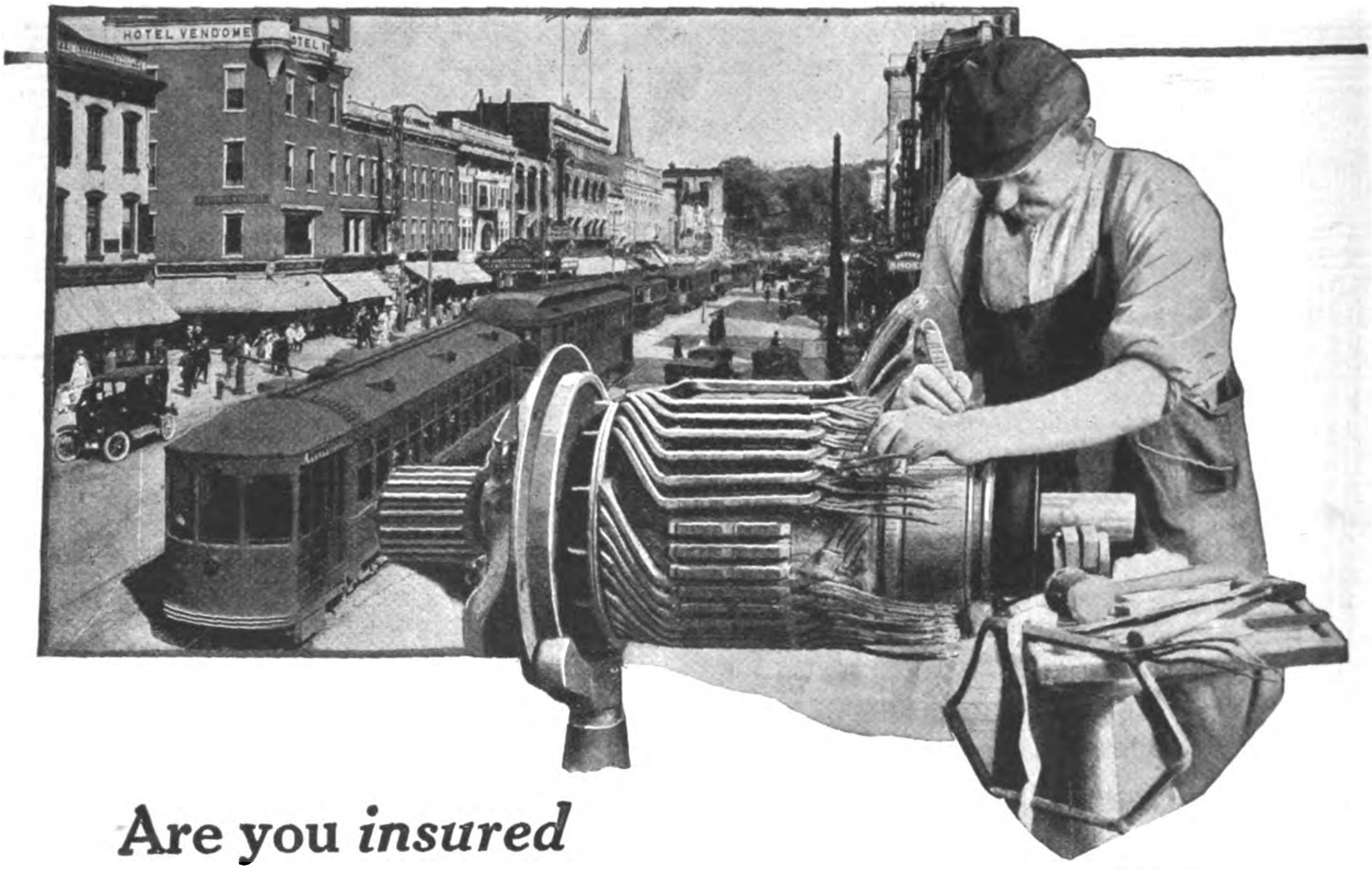
Galena Oils and Service are invaluable to the Electric Railway that is working to secure improved operating conditions. For years they have been demonstrating the fact that Galena lubrication requires only an equitable service comparison to register its matchless efficiency and economy to the satisfaction of any road. A survey of your property entails no obligation.

Galena-Signal Oil Company

New York Franklin, Pa. Chicago

and offices in principal cities

When Service depends on vital, wearing parts



Are you *insured*
with G-E Renewals?

When you purchase G-E Renewal Parts you do more than buy so much electrical or mechanical materials. You invest in the facilities which have built quality into your G-E investment. You take advantage of our interest in seeing that this quality is maintained for maximum service.

Original quality can be maintained only by renewing worn parts with duplicates. G-E renewal parts embody the same research, the same engineering, and the same care in manufacture and test as your original equipment. They provide operating insurance well worth the cost.

As an additional service, G-E Renewal Parts Catalogs help you to get just what you want when you need it. Be sure you have your copy near at hand.

Use your G-E Catalogs
RAILWAY SUPPLIES

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-640

GENERAL ELECTRIC

New York, March 1, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

Henry W. Blake and Harry L. Brown, *Editors*

Volume 63
Number 9

Akron's 5-Cent Rubber Bubble Bursts

THE cars are running again in Akron—at a higher rate of fare. Of course it was tempting, and it did appeal to the imagination, to set out to make Akron the first motorized city. But it takes more than a supply of rubber close at hand to make a satisfactory transportation system. It takes equipment, organization and experience. This the people of Akron now know. They also know that while it might have seemed to point to greater prosperity for Akron to start the movement toward motorizing its local transportation system, inasmuch as its prosperity is so largely bound up in the market for rubber tires, actually it was disastrous to the prosperity of the city to be without local railway service.

This is not to say that the contest waged in Akron proved that buses could not supply the local transportation. There was no test of the bus. There has never been a real test of the bus in any of the cities where there has been a cessation of railway operation. The thing that has been demonstrated in Akron, as in these other instances, is that no responsible party can be found who will sign up to motorize the city at a 5-cent fare, or at a fare as low as the offer of the railway. Only those poor innocents with ample ambition but little knowledge of the transportation business and no financial capacity have been available as ready signatories to a 5-cent or near 5-cent contract.

Enough such examples have now been afforded so that it would seem that in the future public officials and public, if willing to be guided by the experience of other cities, will realize that motorization, so far as it is economic and practicable, must come as an orderly, gradual process. It cannot come overnight by kicking the traction company out of the community, even though there be the disposition to ignore the contribution of the railway in building up the city. It cannot come by setting out to destroy the capital in the railway which was invested in good faith to provide a public service.

Motorization can best come, in so far as it truly adds in a sound way to the transit facilities of a city, by permitting this development to take place in the hands of the one organization experienced in transportation work—the local railway company, and by urging such development. That is what had been started by the Northern Ohio Traction & Light Company in Akron. And as soon as the company is given a definite and fair basis on which to work, it plans to extend materially its use of buses. Thus, the quickest way for Akron to realize its ambition, as far as motors can do the job, is to leave the matter in the hands of the N. O. T. & L. and give that company a square deal.

So it comes about that Akron's rubber bubble has burst.

Outlook for Settlement at Phoenix Improved

PHOENIX, ARIZ., has now decided to go slow. Disgruntled at its local street railway, the first thought was to abrogate the franchise and try to arrange for municipal ownership with private operation. In fact, a committee of citizens appointed by the Mayor recommended this procedure. Now the measure to instruct the City Attorney to proceed to abrogate the company's franchise has been tabled and if the Mayor has his way an independent engineer will be engaged to study the situation and report upon the facts.

A very wise decision is this of Phoenix. In the present state of public opinion over the dispute of the city with the railway about paving, it would probably be difficult to convince the city that it has been enjoying a good thing, but it has. In fact, as to its railway service, Phoenix has been subsidized for years. The owners of the property have never received any dividends. At their expense the residents of Phoenix have continued to ride on a 5-cent fare in a city of only 30,000 inhabitants with 40 miles of paved streets, and in a county where there are 275 miles of paved highway, with a registration of 14,000 private automobiles and 365 days of fine weather every year. These are all facts, except that the 365 days of fine weather is Phoenix's boast. However, even an approximation of this boast adds to the railway's dilemma. The peculiar thing about this situation and others similar to it is that the very persons who in the mass continue indefinitely to accept without a blush a service for which the producer does not receive even the cost would be the first to resent the imputation of charity behind a subsidy handed to them individually.

More Evidence that Salaries Need Adjustment in Electric Railway Field

IT IS difficult to get a true comparison between the salaries paid college men in the electric railway field and those in other industries. Figures of this sort, being personal and confidential in their nature, are not ordinarily available. Recently, however, an organization composed solely of those men who attained the highest rank in college in the electrical courses conducted an investigation of the salaries paid its members in different branches of the electrical industry.

The figures published show the salary range for men out of college two, five and ten years, divided into fourteen classifications of work. The average of salaries for the electric railway men with two years of experience was seventh in the list. Thus it was just an average figure for the whole field. The six classifications paying better salaries at this period, in their order are jobbing, government work, miscellaneous, telephone manufacturing, small electric manufacturing and telephone operating.

But when the graduate has been out five years the electric railway men have fallen to the bottom of the list, being passed by those engaged in large central station work, large and medium sized electric manufacturing, small central station work, miscellaneous manufacturing, contracting, and even teaching. At the end of ten years there could be no further drop in rank, since the bottom had been reached five years before, but the discrepancy between salaries increased, there being a considerably lower average salary for the electric railway man than for the teacher.

The salary for the railway man, in other words, increases less rapidly on the average than that of any of the other groups. From an average of $2,100 at two years out of college, it grows only to $2,450 after five years and $3,050 after ten years—an increase of about $100 a year. The teacher, on the other hand, averages $1,850 at two years, $2,550 at five years and $3,350 at ten years, or nearly $190 a year increase. At the other end of the scale are the jobbers, who average $2,850 with two years of experience, $3,700 with five years and $4,750 with ten years—not quite $240 a year advance. So the teacher whose salary is generally looked on as exceptionally low, actually gets a salary 10 per cent higher after ten years experience than the electric railway man does.

When cold statistics of this sort are published it does not make a pleasant picture for the railway industry to contemplate. While the figures apply specifically to electrical men only, it is believed that it is typical of the groups of trained men in various lines of electric railway work. What inducement is there, then, for the man with a good technical training to spend the best, the most productive years of his life for a pittance, while his classmates in all other lines of the business forge ahead of him?

If the industry is to progress it must attract to its support men who can supply the needed knowledge and virility demanded by the extremely difficult problems of modern transportation. And to do that these trained men must be paid salaries commensurate with the importance and exacting nature of the work. They must have an opportunity to progress at least on a par with those who have picked other lines of endeavor. Until this is made true the electric railway field cannot hope to get its share of the best talent, particularly when such definite information as that quoted is being circulated in college circles.

And the industry suffers accordingly.

A Change in Feeling in Regard to Snow

TEN years, even five years ago, a snow storm meant to most electric railway companies only additional expense and often loss of traffic. Not only did the snow have to be removed, but teams would find the tracks the only part of the street that was cleared, and their slow progress delayed car movements. Owing to the tediousness of travel, shoppers and others not obliged to take the cars would remain at home.

The present extensive use of private automobiles has changed all this. Following a snow storm many automobile owners leave their cars in the garage because the snow in the streets makes automobile driving difficult and disagreeable, and the snow piles at the sides of the streets limit parking space. The effect on street railway travel is noticeable; in fact, the net gain from additional passengers in many cases undoubtedly far exceeds the cost of snow removal. Railway men in the New England States say they have had substantially less riding this winter than last on account of the open winter.

This again is an illustration of the essential character of the railway transportation in any community. Whenever other means of travel fell down, the people turn to the trolley. Not only is the street car, with its comparatively powerful motors, well fitted to make its way through the streets when conditions are bad, but the organization behind it stands ready to fight the elements in a way that individuals acting singly cannot attempt. This is one of the points that should be given consideration when an attempt is made to evaluate electric railway transportation in comparison with its competitors.

Judas Had the Decency to Hang Himself

A YEAR ago last August, during the strike of the employees of the International Railway, a train on that company's Niagara Falls high-speed line ran into a section of track destroyed by dynamite. One car of the three-car train left the track and turned over on its side. Fifty persons were injured. Suspicion fell on members of the Amalgamated Association. Now, more than a year and a half later, convictions have been secured before a Federal judge on the technical charge of transporting dynamite in interstate commerce, and sentences of one year in jail and a nominal fine have been imposed on each of four of the men alleged to have been connected with the case. The case was brought in the Federal court under the technical charge of violation of an interstate commerce provision because it was the judgment of those charged with the prosecution that a jury in the local courts could not be depended upon to render a verdict in accord with the evidence. On the same basis, shortly, more of the men alleged to have had a hand in the Buffalo dynamiting will go to trial on the same basis.

This very briefly is an outline of the news facts connected with the case. They will bear careful consideration. Entirely aside from the merits of the controversy between the railway and its men, it represents another sad chapter in the history of trade unionism that places Buffalo beside the outrage at Herrin and the dynamiting of the Los Angeles *Times*. If ever men "sold out" their union associates these men at Buffalo did so. If there is such a thing as trust in unionism then these men betrayed it. They were no less offending in their way than was Judas Iscariot, who sold his Saviour for thirty pieces of silver. Judas had the decency to go hang himself. But the Buffalo criminals who have so far been convicted have appealed their cases to a higher court in an effort to stay their absurdly mild penalty. In passing sentence, of course, the court was confined in the degree of severity of punishment which it could impose by the limitations of the technical charge on which the men were arraigned. It is impossible to fathom the feeling of the court, but it does not seem unreasonable to think that perhaps the judge had in mind the classic lines:

> O pardon me, thou bleeding piece of earth,
> That I am meek and gentle with these butchers.

Semi-Automatic Substation at Concord

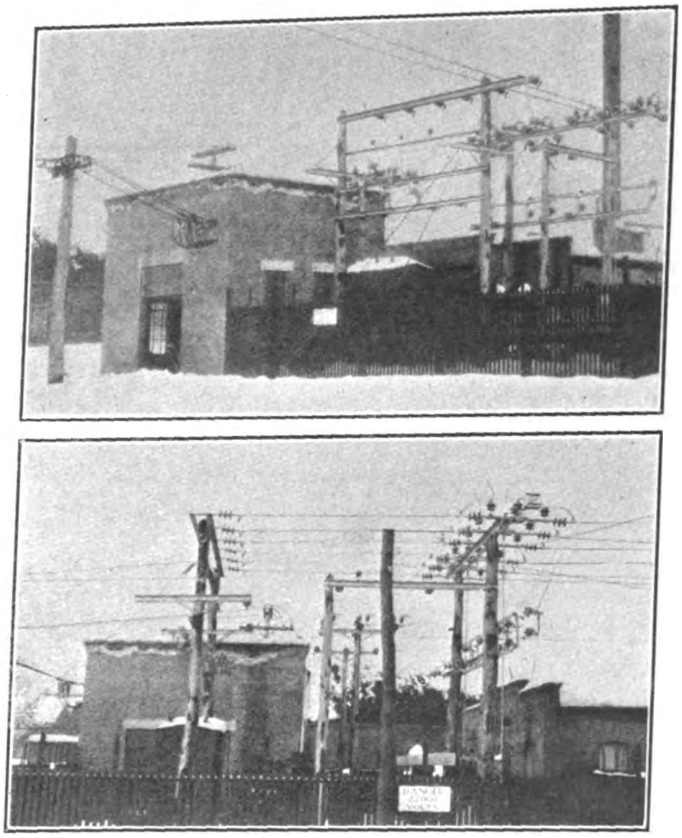
The 500-Kw. Unit Needs Only to Be Started in the Morning—It Operates Without Attention and Shuts Itself Down Automatically at Night—The Installation Is an Improvement Over an Earlier One of Smaller Capacity Destroyed by Fire

A NEW type of semi-automatic substation has been installed by the Concord Electric Railways, Concord, N. H. This station has been worked out to obtain all possible automatic features that could be obtained at a minimum cost, without going to the expense of installing full automatic equipment.

In the ELECTRIC RAILWAY JOURNAL of Feb. 4, 1922, page 184, an account was given of the automatic substation equipment at that time recently installed by the railway, emphasis being laid upon the labor-saving features of the two substation layouts then completed. On Dec. 4, 1922, the West Concord automatic substation was destroyed by fire, and the company at once began to study the question of replacement. J. B. Crawford, superintendent, was convinced that any new installation should be designed as such from the ground up, housed in a fireproof structure with as much outdoor equipment as good practice would allow, and possessing the more important features which experience with the South Main Street substation and the one destroyed had shown to be desirable. As a result an entirely new substation has been built at West Concord, and provision made there for suitable interconnection with the lines of the Concord Electric Company, the local central-station organization, as well as for semi-automatic service in the supply of energy to the railway.

The new substation, shown in the illustrations, has a rating of 500 kw. instead of the 300 kw. of the former installation. It is adjacent to an old steam plant which housed the earlier equipment, the steam installation still being held in reserve in case of a serious power shortage at the Franklin hydro-electric plant of the railway, or inability to secure adequate power from the local central station. All the high-tension equipment is located outdoors. The substation building, which is only 24 ft. by 22 ft. in plan, is of brick, with a concrete floor and wireglass windows. The windows are also provided with heavy screening to protect them from missiles, the substation being in a semi-rural location. One of the pictures shows a side view of the property, with incoming transmission lines, and another shows the lightning arrester equipment, which is of the oxide film type and was furnished by the General Electric Company.

The company's facilities for operation and maintenance supervision, coupled with lower first cost, led to the choice of a semi-automatic equipment for West Concord. The building houses a 500-kw. Westinghouse rotary converter and switchboard. The automatic apparatus was supplied by the Automatic Reclosing Circuit-Breaker Company, Columbus, Ohio. The converter delivers 600-volt direct current to the trolley system, and the unit runs at 1,200 r.p.m. The cost of the new substation, exclusive of the transformer bank and interconnection with the Concord Electric Company, was about $40,000.

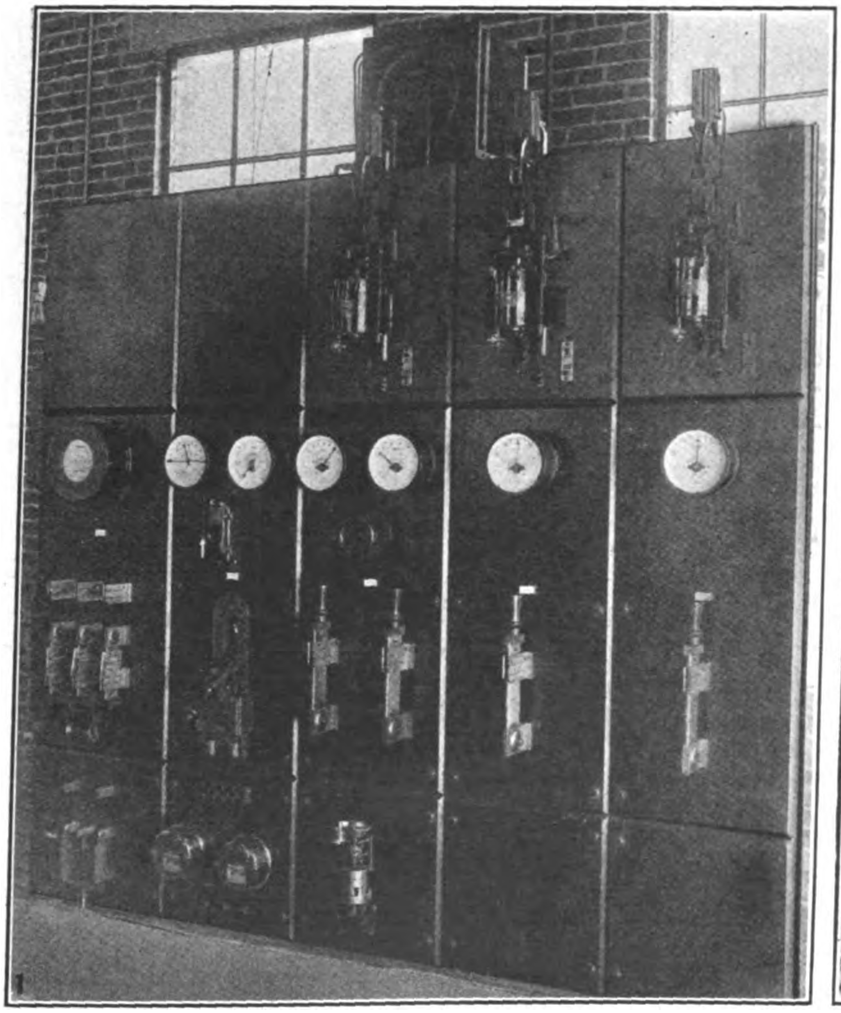


Front and Side of New Semi-Automatic Substation at Concord, N. H.

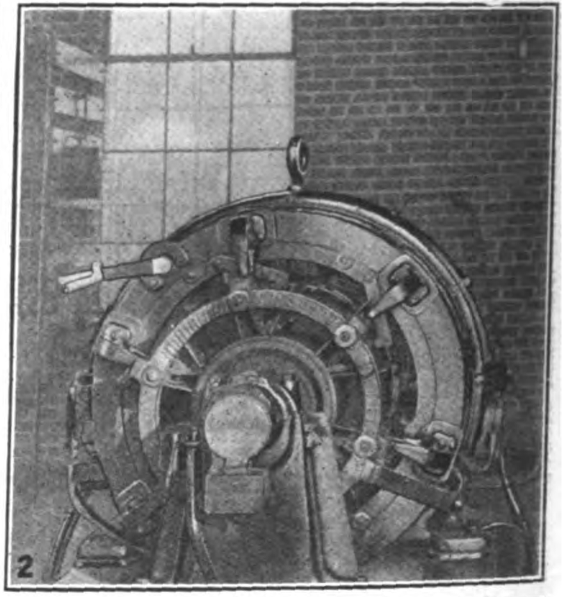
The scheme of connections at West Concord is indicated in the single-line connection drawing. As outlined in the previous article, the major source of energy supply is at Franklin, 19 miles north of the city of Concord. Two 22,000-volt, three-phase lines pass the West Concord substation, and from each of these a tap is taken through disconnecting knife switches to an outdoor bus structure in the substation yard. A tap to the lightning arresters is taken off each branch circuit, and after passing through choke coils the two branch lines are brought together into a common overhead bus with disconnecting switches in each phase between the coils and the bus. One three-phase connection is then made through disconnecting switches to the railway equipment and one to the Concord Electric Company interconnection apparatus.

The railway service equipment includes a 22,000-volt oil circuit-breaker mounted in an inclosure on a concrete foundation, just outside the substation building, and a bank of three 167-kva. transformers which reduce the potential to 432 volts. The secondaries of these transformers are connected by a three-phase underground line with the switchboard and rotary converter inside the building. The detailed scheme of wiring is indicated in the larger line diagram.

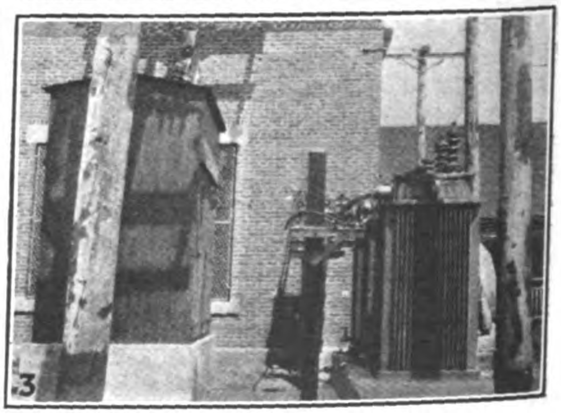
The switchboard for railway service consists of five panels. From left to right these are assigned to the following uses: Starting, alternating-current side of



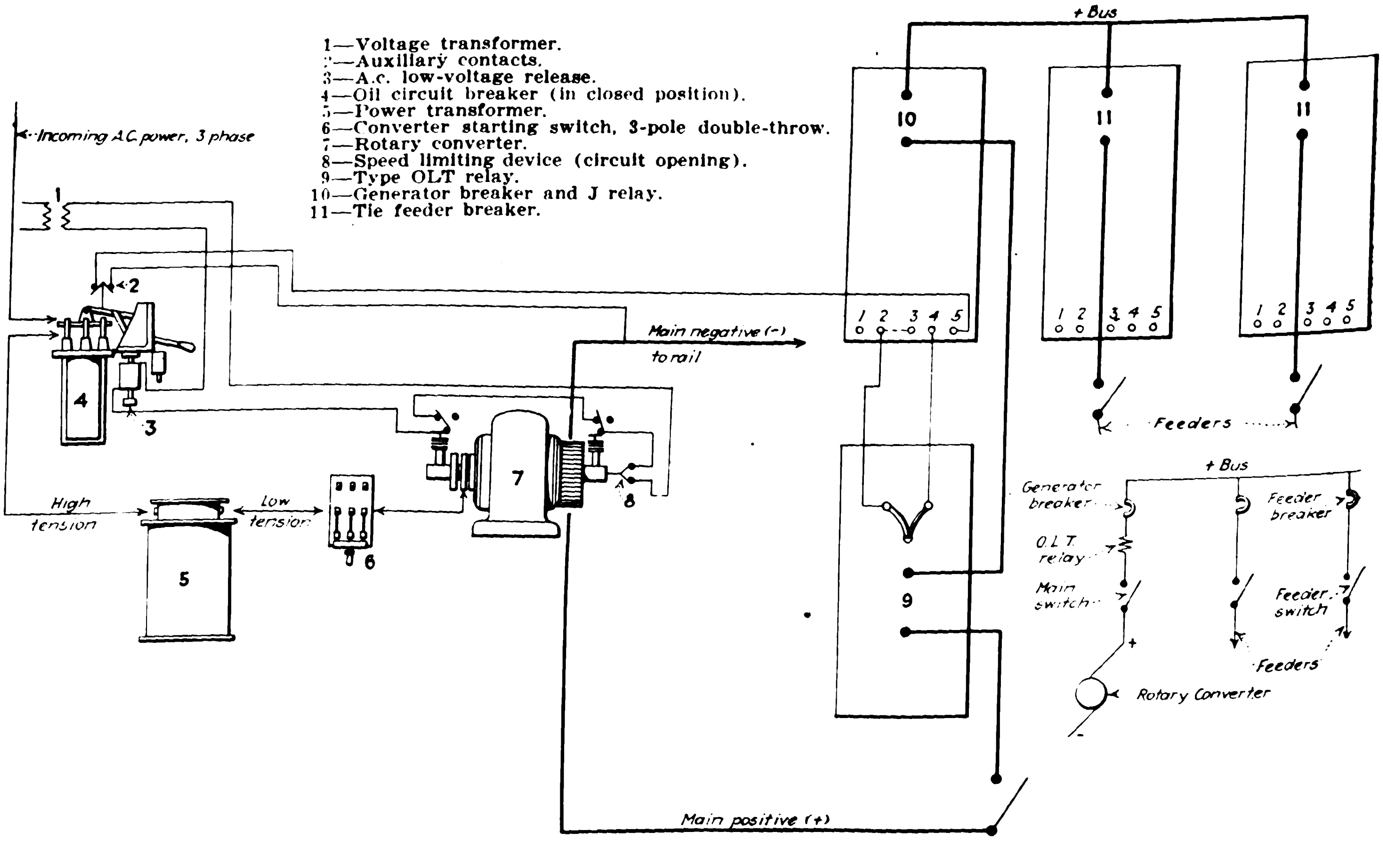
No. 1. The automatic switching equipment is shown at the tops of the switchboard panels.



No. 2. The dimensions of this 500-kw. converter are smaller than those of the 300-kw. unit it replaced.

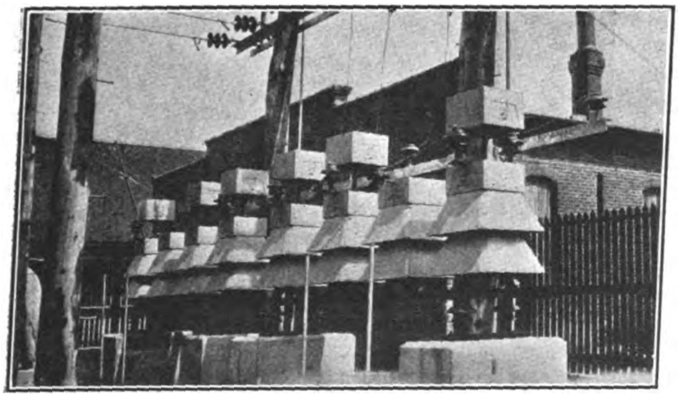


No. 3. The transformer bank is shown at the right; at the left is a housing for the high-tension circuit breakers.


Incoming A.C. power, 3 phase
1
2
3
4
5
6
7
8
A
9
10
11
11
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
High tension
Low tension
Main negative (−) to rail
Main positive (+)
+ Bus
Feeders
+ Bus
Generator breaker
Feeder breaker
O.L.T. relay
Main switch
Feeder switch
+
Feeders
Rotary Converter
−

1—Voltage transformer.
2—Auxiliary contacts.
3—A.c. low-voltage release.
4—Oil circuit breaker (in closed position).
5—Power transformer.
6—Converter starting switch, 3-pole double-throw.
7—Rotary converter.
8—Speed limiting device (circuit opening).
9—Type OLT relay.
10—Generator breaker and J relay.
11—Tie feeder breaker.

Diagram of Connections of the West Concord Substation. A Schematic Diagram of the D.C. Connections Is Shown in the Insert at Lower Right



The Lightning Arresters Are Connected to the 22,000-Volt Lines

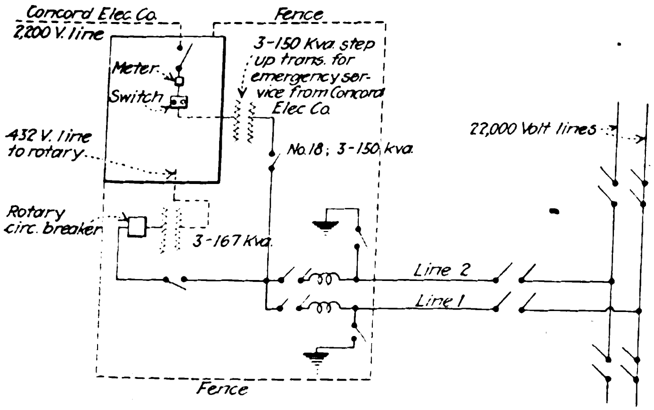
rotary, direct-current side of rotary, and two feeders. The starting panel carries a watt-hour meter, starting and running switch, and reversing switch for changing the polarity of the rotary. The alternating-current rotary panel carries a reactive-factor meter, ammeter, Anderson time switch for cutting off the substation at a predetermined hour of night after the day's run, a handle for manual working of the 22,000-volt circuit-breaker when necessary (with bell-crank lever running outdoors) and two time-element overload relays which close the circuit through the 22,000-volt breaker trip coil in case of protracted overload. The breaker is of the solenoid-operated type.

AUTOMATIC RELAYS CONTROL BREAKER

The direct-current panel for the rotary contains a volt-meter, ammeter, positive and negative knife switches, field rheostat handle and an automatic reclosing circuit breaker. This breaker is equipped with an automatic reset reverse-current relay and a type OLT long time interval overload relay, whose function is to allow a high setting of the breaker for instantaneous overload, while at the same time it protects the generating unit against prolonged excessive overload. The reverse-current relay protects the generator unit against reversal of current and allows the unit to be connected automatically to the bus when the correct polarity has been restored.

This breaker is also interlocked with the a.c. side through auxiliary contacts on the a.c. oil circuit breaker so that in case this is tripped, due to excessive overload, phase failure, no voltage, operation of the time clock, overspeed, or operation of the bearing thermostat, the d.c. side will be disconnected from the bus.

Each feeder panel contains a single-pole knife switch, ammeter and automatic reclosing circuit breaker. In case of outside short circuit the feeder breakers remain open until a definite time cycle has elapsed and will not again close until the excessive overload or short circuit has been removed.



One-Line Circuit Diagram, Showing Interconnection of Railway and Central Station Power Supply Systems

OPERATING COST LOW

The only attention required is starting the substation in the morning and regular inspection of the equipment. One maintainer starts the unit at 4.45 a.m., and the installation operates until midnight, when the Anderson time switch cuts it off. The total cost of inspection and operation is about $800 per year. The substation was placed in service in June, 1923, and has given entire satisfaction since.

The substation is wired for direct-current series lighting and for emergency lighting from a.c. multiple service. A bank of three 150-kva. transformers stepping up from 2,300 to 22,000 volts is provided outside the substation building for the interconnection between the Concord Electric Company and the Franklin-Concord transmission lines, with a General Electric oil circuit breaker, watt-hour meter and disconnecting switch mounted inside the building. A 500,000-circ.mil 600-volt direct-current railway feeder passes through the substation, and a knife switch mounted outdoors provides means of by-passing this substation if it is desired to work upon the interior equipment. It is of interest to note that the new rotary converter is only about one-third the size of the former 300-kw. unit, and will withstand a 50 per cent overload for two hours.

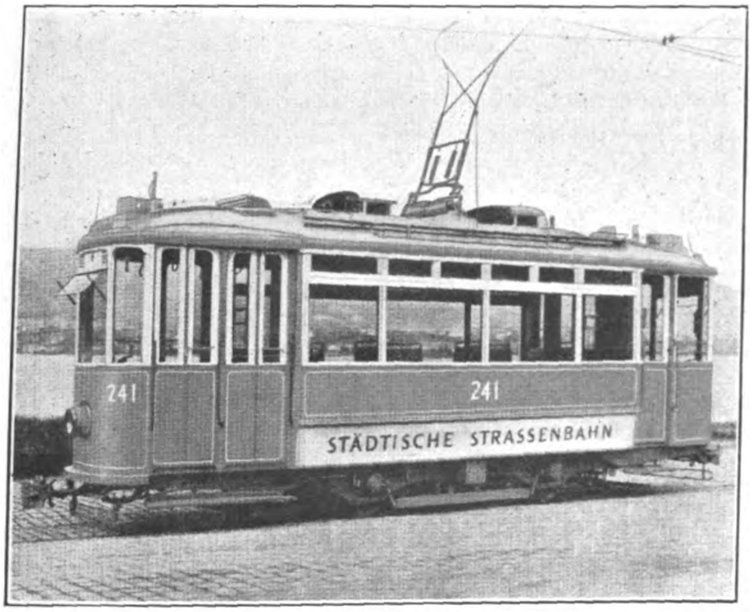
Trolley Guides in Portland, Ore.

A GREAT many cities indicate their different routes by letters or numerals carried on the dashboard, hood or other conspicuous place. The Portland Railway, Light & Power Company, Portland, Ore., goes a step further and publishes a twelve-page pocket folder showing the routes taken by the different lines, so marked, with a statement of the times that the first car and the last car of that route leave the terminals. The form in which the information about a single line is published is reproduced below.

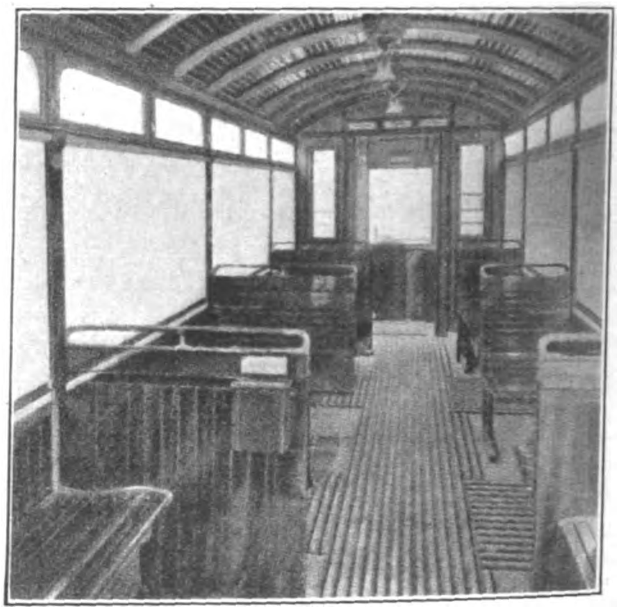
A very brief reference to this guide was published in the issue of this paper for Feb. 2, but by a typographical error the name of the city was given as Portland, Me., instead of Portland, Ore. The Portland Railway, Light & Power Company gives these guides to passengers on request and they are supplied from ticket offices, agencies, information bureaus, hotels, etc. The guide has been found to be a business getter.

RC ROSE CITY—*Outbound*—From Fifth and Washington Streets via Washington Street, Second Street, Burnside Street, Burnside Bridge, East Burnside Street, East 10th Street, East Davis Street, Sandy Boulevard to East 82nd Street. *Inbound*—Return same route to Burnside Street to Fifth Street to Washington Street.

First car leaves	—Fifth and Washington	5:59 A.M.
	82nd and Sandy Blvd	5:30 A.M.
Last car leaves	—Fifth and Washington	12:30 A.M.
	82nd and Sandy Blvd	12:01 A.M.
Owl car leaves	—Fifth and Washington	1:30 A.M. and hourly
	82nd and Sandy Blvd	2:01 A.M. and hourly



The Influence of American Practice Is Seen in This Swiss Motor Car



This Seating Arrangement Is Used Because the Car Is Only 7 Ft. 2 In. Wide

Larger Motor Cars for Zürich

An Important Feature in Construction Is Continued Use of Aluminum Panels—They Are Used for Train Service with Light-Weight Trailers

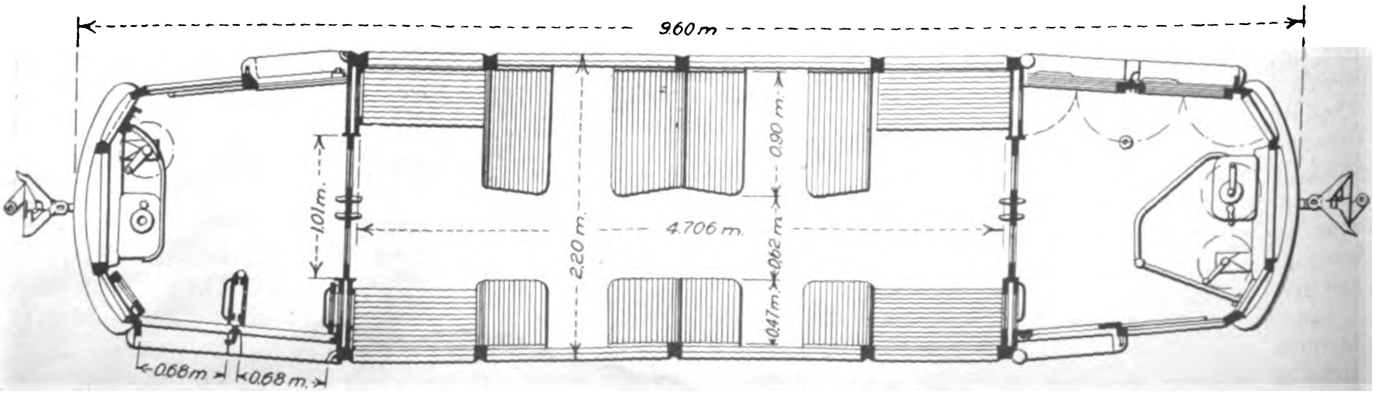
THE Municipal Tramways of Zürich, Switzerland, serving an industrial population of some 215,000 persons, has recently added twenty motor cars, eighteen trailers and six rebuilt open summer cars to its equipment. The motor cars are of particular interest as showing the most recent development in Continental practice.

Although double-truck cars were considered impracticable for Zürich track and passenger-interchange conditions, the length of the car body proper was extended from 4.16 m. (13 ft. 7 in.) to 4.7 m. (15 ft. 5 in.) and the width enlarged from 2 m. (6 ft. 6 in.) to 2.2 m. (7 ft. 2 in.). The latter change made possible the first use of the cross-seats to the extent of a double seat on one side and a single seat on the other. The platforms and vestibules have been tapered American style, following the management's previous use of this construction on its Forch suburban railway. Separate exit and entrance is now provided at the rear by means of double-folding doors, while a sliding door at the motorman's end provides for front exit. The body has end doors of sliding type. The over-all length of the car over vestibules is 9.58 m. (28 ft. 1 in.) and over couplers, etc., 9.6 m. (31 ft. 6 in.).

The car interior has twenty seats, but only four standee spaces. On the other hand, the official standee spaces on front and rear platforms are ten and eleven respectively. Thus, the legal carrying capacity of the car is forty-five passengers, twenty seated and twenty-five standing. The preceding (1915) type motor car had a total capacity of but thirty-five passengers.

The entire body length is taken up by only four fixed sash, but ventilation is provided by means of six narrow hinged sash above these stationary windows. Each vestibule is provided with a hinged sash for regulation by the motorman, according to weather conditions. Each vestibule also has a louver ventilator on each side of the signal light above the hinged sash. The car roof is also provided with two louver ventilators which operate in connection with the auxiliary hinged side sash mentioned.

The framework of the car is of oak, ash and pitch-pine, and the general finish in ash, oak and elm. The panels, however, are of aluminum in accordance with the management's standard practice since 1910. The body panels are 2 mm. (0.0786 in.) and the platform sheathing, 3 mm. (0.1181 in.) thick. The advantages found in practice are given as: (a) Easier maintenance, as in restoring bent portions; (b) less repainting than sheet steel; (c) less weight. Oxidation can be kept to a negligible amount if all contact surfaces between the sheathing and the posts are first well covered with oil paint.



Floor Plan of the Zürich Motor Car

The motor-car body is carried on the truck through four leaf springs. The wheelbase is 2.6 m. (8 ft. 6 in.) instead of 2 m. (6 ft. 6 in.), as in the previous design. Among the up-to-date features are ball-bearing journals and automatic couplers with which the electric braking of motor and trailer is included. The two motors are rated at 60 hp. each at 500 volts, and 66 hp. each at 550 volts. The gear ratio is 1 to 4.8 and the car-wheel diameter, 860 mm. (33.8 in.). The controllers have six series positions, four parallel positions and six additional positions for the four electro-magnetic track brakes. Both the resistors and the circuit-breaker are mounted on the roof. Bow trolley collectors are used, as is customary in Zürich practice.

The total weight of a motor car is 12,800 kg. (28,300 lb.), of which the two motors alone contribute 2,700 kg. (5,960 lb.).

Of the eighteen trailers, nine are of the same width and with the same door arrangements as the new motor cars. These cars have sixteen seats and official space for twenty-six instead of twenty-two standees. They weigh 5,200 kg. (11,440 lb.) complete. Automatic couplers with electrical contacts for the brake system are used.

It may be of interest to add that while part of the electrical installation was made at the railway shops and part at the car builders' plants, the work in both cases was done by the personnel of the railway.

Important Points in Traffic Control

An Analysis of Four Important Points in Traffic Control with Their Effect on Street Congestion—Suggestions Are Made for Practical Relief

By J. Rowland Bibbins

Consulting Engineer, Washington, D. C.

IN THE ELECTRIC RAILWAY JOURNAL of Feb. 23 the broader aspects of the so-called "traffic problem" were discussed by the writer. But certain phases of the program suggested will justify much further research, along technical and economic lines, than they have received in the past. These are:

1. Increase in traffic signal control efficiency in relation to track and roadway capacity, especially at master control or key crossings.
2. Developing track capacity at electric railway downtown terminals to the fullest extent, speeding up terminal operations and providing for expansion of the terminal district and service.
3. Economic design of roadways, both in cross-section and alignment, and their economic use for maximum efficiency of the whole thoroughfare system, including transit, traffic and combined purposes.
4. Perfecting routing and operating methods, so as to forestall uneconomic competition, through betterment of rail service.

It has become quite apparent to the writer, after considerable study, that these factors are closely interdependent. This is one reason why adequate results as a whole have not been achieved in our city-congested districts because, as a rule, only one part of the problem has been considered, and this not always in a very scientific manner.

TRAFFIC SIGNAL CONTROL EFFICIENCY

Of this group, traffic signal control is perhaps of first importance. Too often the policemen on the corner, not the president of the company, determine the schedules on which the railway system will be run. Detailed time-studies indicate that today a very large amount of crossing time is lost due to the unscientific application of signal control. Moreover, this delay is cumulative, both as to cars and traffic, and mounts in lost time and money into colossal figures. Several points are involved:

(a) The duration or length of the signal cycle. This is most important and should vary according to the time of day and pressure of traffic movement.

(b) Relative distribution of time between stop and go signal—in proportion to the traffic needs in each direction.

(c) A preparatory signal. This is desirable but seldom used.

(d) Relativity of main line and cross traffic movement.

This last determines whether the master control of a long street or of a given traffic area can be properly carried out from one key point. Curiously enough, "Main Street" traffic is usually supposed to be largely *through* movement, but a traffic survey often shows the contrary, i.e., that "Main Street" is simply a *clearing street* for transverse traffic and not through traffic. In that case it should be signaled just like any terminal intersection and not as a trunk line. In some of the block signal installations in this country this incorrect assumption has led to such great confusion that the fixed block system as applied to the through artery had to be abandoned at times, although retained at the key point.

There is much to be gained by the study of the variable versus fixed signal system. For some reason, almost all of the block signal systems that have been installed have been placed on an arbitrary fixed period basis running through the day (9 a.m. to 9 p.m.) regardless of the traffic, the weather, the day of the week or the season, and particularly of the varying amount of cross traffic. The result is needless waste of street capacity and unnecessary delay to all traffic during many hours of the day. It is only necessary to observe, in cases of this kind, what a large proportion of the signals are held open after all traffic has passed (i.e., with an idle crossing), waiting for the clock to tick for the next signal change. This is most unscientific. Street car schedules cannot contain so much lost motion. Why should traffic?

A general guide to good signal control should be the minimum of rigidity, whether by block signal, semaphore or hand control. In fact, it is curious to observe how the rigid semaphore system has fastened itself onto our police regulations, and it only too often occurs

TABLE SHOWING COMPARATIVE EFFICIENCY OF THREE-PART AND TWO-PART CYCLE

	Three-Part Cycle, Length Two Minutes or Thirty per Hour			Two-Part Cycle, Length One and a Half Minutes or Forty per Hour			
	For Cars	For N.-S. Vehicles	For E.-W. Vehicles	For all N.-S. Traffic	Equivalent Number of N.-S. Passes*	For all E.-W. Traffic	Equivalent Number of E.-W. Passes*
Length in seconds for movement	30	45	45	45		45	
Average number of unit passes per movement	4.37	27.4	26.7	1.34 cars and 20.5 vehicles	25.9	1.93 cars and 20.1 vehicles	27.8
Equivalent number of unit passes per minute of et	8.74	36.6	35.7	1.8 cars and 27.4 vehicles	34.6	2.56 cars and 26.8 vehicles	37.0

* Based on an equivalent of four autos to one car.

that semaphores are installed long before they are justified. It has been demonstrated that even fairly heavy traffic will clear itself automatically and only needs a restraining hand to prevent tangles. Permissive hand control, even when semaphores are used, greatly facilitates turning movements, especially permissive right hand turns. The fixed signal intervals of the automatic "lighthouse" signal are correspondingly subject to criticism in some important locations as they exhibit no intelligence in apportioning signal periods to the demands of traffic. Some, however have the variable feature, i.e., may be adjusted by hand or by distant control.

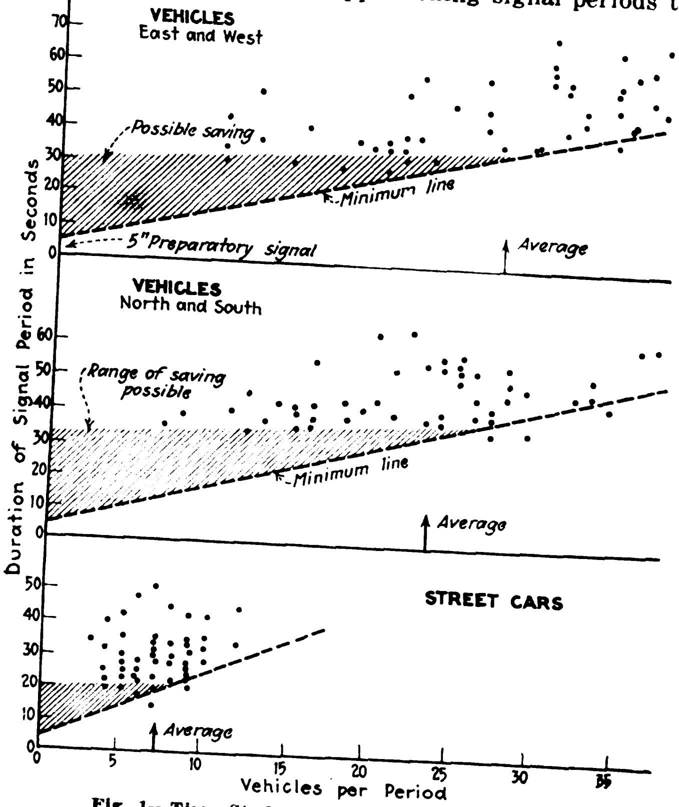


Fig. 1—Time Study of Variable Signal Control

Dots indicate actual motor and car traffic observed for varying length of signals according to street conditions. A fixed master control traffic signal on the same street a few blocks away divides the traffic movement there into three periods: Forty-five seconds for north-south vehicle movement, forty-five seconds for east-west vehicle movement and thirty seconds for surface car movement, making a two-minute cycle. But note how small a proportion of the actual traffic this fixed signal a few blocks away actually affects.

Generally speaking, the shortest possible interval in the long run yields the greatest street capacity. A speed-time curve of traffic in platoons running one block each would indicate about twenty-five seconds between start and stop; two blocks, forty-five seconds. Thus, a skip-stop platoon system, assuming equal cross traffic, would call for a one-and-a-half-minute cycle along the "Main Street," or perhaps only one minute with light cross traffic. Yet we find block signal cycles ranging from two to three minutes duration. The seriousness of this cumulative delay to street car operation as well as to traffic can hardly be overestimated.

The accompanying graph shows a time study at a heavy intersection along a ten-block "Main Street" with block signal system supposed to be operated in synchronism but actually operated independent of the master-control towers. The graph shows the actual number of seconds required for each signal and the number of vehicles passed through that signal in each direction. The master signal is arranged on a cycle of two minutes, divided as follows: Thirty seconds for all cars to move, all traffic stop; forty-five seconds for north-south traffic only, all cars stop; forty-five seconds for all east-west traffic only, all cars stop. Yet it will be noticed that at the crossing shown in the diagrams the north-south traffic ranges from seven to thirty-seven vehicles per signal, but also that the signals vary from thirty-five to sixty-five seconds. Similar great variations are shown in the case of east-west traffic. Further, the time taken to pass five cars varied from twenty seconds to forty-two seconds, and for seven cars, fifteen seconds to fifty-two seconds. This variation indicates the wide range of traffic conditions actually encountered and how important it is to leave room for a certain amount of flexibility and intelligence in the signal control according to conditions.

But the most important point is this, that a signal of thirty-five seconds can pass vehicle movement up to thirty vehicles per signal. On the other hand a time interval of thirty-five seconds was used to pass as low as seven vehicles per signal. Similarly in east-west traffic thirty seconds should pass perhaps thirty-five vehicles, but the same signal period was used for ten only. Here is a great wastage of street capacity in the present signal application.

Fixed signals are too long for light traffic and maybe too short for maximum traffic. In this illustration all traffic on the street is held up every two minutes, street cars for ninety seconds and vehicle traffic for seventy-five-second intervals; that is to say, thirty cycles per hour. To demonstrate the wastefulness of these long intervals, this traffic was recast on the assumption of forty cycles per hour (instead of thirty) in a straight two-part signal (instead of a three-part) with the cars moving at the same time with the vehicles in the same direction. The result was that the average equivalent total traffic per cycle, including car movement or per minute of street opening, was actually no greater than with the longer cycle shown in the diagrams, excluding car movement. This is shown in the table above.

How important is this element of variability is indicated by the following figures, showing actual traffic movement per signal, with varying durations of periods of observation:

	Motors	Cars per Signal
Average rush hours 4 to 6 p.m.	50	4.4
Maximum sixty-minute rush period	54	4.5
Maximum thirty-minute rush period	63	4.9
Maximum fifteen-minute rush period	78	5.7
Maximum five-minute rush period	94	8.0

The study of signaling is highly complicated, even more so that in railroading, due to the many uncertain factors. But one thing seems certain—that more flexibility and exercise of judgment are needed if the traffic of the central district is to be speeded up rather than slowed down.

Perhaps less regulation, rather than more, would be advantageous, as proved in the case of an important intersection in Washington, once badly congested. The policeman fell sick and nobody was available to replace him. The traffic promptly cleared itself, and he has been replaced by some well-placed permanent guide curbs in the street. It seems especially unfortunate that the use of the fixed synchronous block signals should be suggested for use in various cities because these have helped Fifth Avenue, New York, where conditions are unique. The installation of such an elaborate signal system should not be made until comprehensive traffic surveys and time studies have been made to determine the characteristics and needs. Then the system should be designed to meet those needs and not for conditions in some distant city.

DEVELOPMENT OF DOWNTOWN TERMINAL CAPACITY

The cumulative effect upon the operation of street railways of all the natural and artificial congestion just described is well indicated in the second graph, showing the actual minutes transit time by 150 cars looping in the downtown district at various times between 4 p.m. and 6 p.m. It will be noted that the looping time at 4:15 averaged about twelve-and-a-half minutes, at 5:20 twenty-two-and-a-half minutes, at 6 o'clock thirteen minutes. Some of this lost time is of course due to street car interferences in special work and additional time required for loading, etc. But the major proportion of it clearly occurs from traffic congestion and signals. The average trip running time of the system between termini is only about forty minutes. Thus, with the average haul, if a passenger boards these loop cars inbound to obtain a seat, more than half of his trip home is consumed in the loop. This twelve-and-a-half minutes lost time is the real point of attack. And it is easy to see when a two-minute signal cycle is imposed upon the system along the main clearing streets how this loss of time accumulates before cars can escape from the controlled area.

In developing terminal track capacity, the same type of time study should be made before elaborate or radical changes in routing and operations are put into effect. These involve the relative number of car interferences under various routing schemes, the effect of non-clearance curves, open and closed loops, proper distribution rather than concentration of loading points, standardizing of rolling stock and tractive capacity so far as possible on given lines, location of special work, segregation between railway and motor streets, and of course the effect of the signal system. Such studies on a large system for various routing plans in the terminal district have shown variations of from 100 to 200 per cent in actual track capacity at the critical point, which of course determines the minimum headway of a trunk line.

These traffic observations and surveys indicate this important point—that unless simplification of routing, ease of riding from one part of the city to the other and speed of transit can be secured there is no other way in which to forestall uneconomic competition with the railway system and the growing use of private motor cars in rush hours, especially in crosstown service. For the motor car, even if excluded through more and more rigid regulation from downtown streets, will discover by-pass routes and thus secure what is most desired, speed. Too much effort has been expended in the past on "verboten" regulations and too little upon studies of fundamental corrective measures.

ECONOMIC DESIGN AND USE OF ROADWAYS

It is a sad commentary on civic understanding and ingenuity that in a recent traffic survey of the entire central district of a large city the writer found an actual traffic efficiency of the outlet streets during maximum rush hours, outbound, of only 25 per cent of the full capacity of these roadways (even assuming solid parking along the curbs). City authorities and even railway men still recommend the decimal system of street width, notwithstanding that decimal widths have little or no relation to the traffic needs of the roadway.

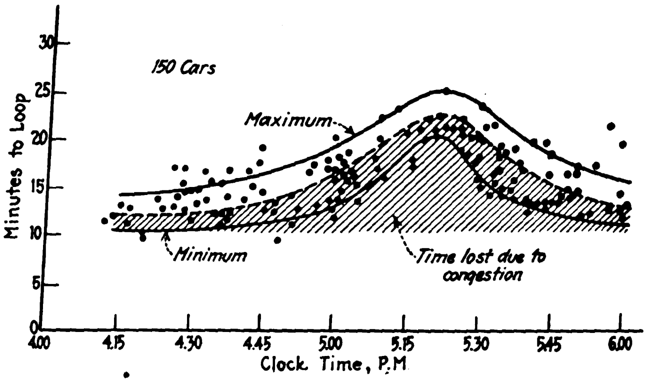


Fig. 2—Time Study of Rush Hour Transit Time Through the Loop District

This chart shows what "congestion" means in lost car-hours. Dots indicate the actual round trip time to complete terminal loops non-rush and rush respectively. The area of the "hump" converted into lost dollars, passenger time and patronage would seem to justify improvement measures.

There are certain minimum widths required for various traffic lines. Obviously it is a waste of money to rebuild or widen streets unless it is possible to jump from a four-line to a six-line roadway, for example. The only exception would be to secure a five-line roadway either where one-way operation cannot be avoided or with shifting center lines, morning and evening. Taking the land values and incidental damages at only $1 per square foot, auto streets will cost for land from $70,000 to more than $110,000 per mile to widen the roadway to the next higher stage necessary to secure any increased capacity at all, and trucking streets will cost from $90,000 to $130,000. With reconstruction and paving these figures might amount to four or five times those given. And the unit figure quoted is of course very low. If the full traffic width is not secured, the cost of the change is of course practically lost.

Every main thoroughfare has a different character, use and traffic demand factor, and requires special design at various points. Especially is this true on street railway thoroughfares where surface loading stations have become almost imperative, not only to speed up car loading and reduce street accidents but also to keep traffic moving in streams instead of blocks. The low traffic efficiency above cited was found to be due not only to the rambling of motors all over the streets but mostly to the fact that the city has paid no attention to the reconditioning of the majority of these outlet streets, all of which were 90 ft. wide or over. The trouble was not all downtown, but fundamentally rested upon the defective thoroughfare plan of the city, which in most cases can be readily corrected.

Why are not more engineering and high-class railroading put into the traffic problem? The plain result of negligence in this particular case is this—that through this downtown district there were actually recorded during the business day one vehicle movement to every two-and-a-half people residing in the entire community, an extraordinary amount of needless cross-town traffic through the center, and an outbound vehicle passenger movement during maximum rush hours approaching that of the street car system. Congestion, poor street design, inefficient traffic operation, complicated street car terminal routing and lack of scientific cartage control in railroad and industrial freight through the loop inevitably results in slowing down the entire system until people turn to private automobiles as their last resource. The writer confidently believes that a scientific attack upon this problem offers the possibility of doubling almost immediately the traffic capacity of the streets of our congested districts.

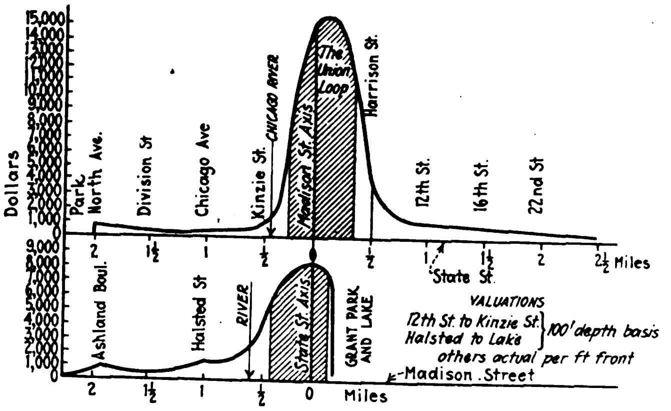


Fig. 3—For the Future Why Not Fill Up the Valleys?

Profile of land values along the main axes of a typical large city. If we are "congested" now with perhaps only 30 per cent of the maximum permissible building floor space developed, what will occur with full development? Land values, building heights, local transportation and congestion complete the vicious circle.

IMPROVED ROUTING AND OPERATING METHODS

The perfecting of routing and operating methods is the final step in which the street railway industry can contribute a large share toward prompt improvement of the traffic situation. But no such improvement can be hoped for with adherence to obsolete methods, complex terminal routing and undue concentration of terminal movements. It is often helpful to develop alternative routing plans designed to untangle the loop and diffuse business over a larger area so as to be comparable with present or other plans proposed. The comparative car interferences, track density, loading density and transit time will immediately tell the story.

All too often this concentration has been brought about by the insistent demand of powerful real estate and business interests which are alone concerned in maintaining high land and rental values of abutting property. What this means must be clearly evident from the accompanying profile of land values, north-south and east-west, in a great city. Concentrated transportation means high land values, higher buildings, traffic congestion, then more transportation, and the vicious circle is retraced until the ultimate of congestion—stagnation—is reached. Shall we develop our cities along this unscientific method or set to work to devise a scientific plan of transportation based upon facts?

Telephone Dispatching in San Antonio

After an Experience of Ten Years the San Antonio Company Is Strongly in Favor of Telephone Dispatching for City Service—Many Advantages Are Listed

BY WILLIAM W. HOLDEN
Superintendent of Transportation, San Antonio Public Service Company

IN ORDER to give proper supervision of its service at all times of the day and to keep in the closest possible contact with the operation of its cars, the San Antonio Public Service Company has maintained a telephone dispatching system since 1914.

Under this system, the dispatcher is located in the company's office building, and his switchboard is connected directly to telephones located at the terminals of all lines and at all junctions and other intermediate points of importance, especially at crossovers where cars may be required to turn back to fill open spaces in schedules caused by delays.

All motormen and operators regularly call in at the end of the lines. In case a car is delayed and a second car is following close, the crew will call in at an intermediate phone for orders. Minor accidents, delays, and defects in track, overhead, cars, equipment and supplies are reported at the ends of the lines. Major accidents are reported from the first available private or company phone.

The telephone dispatching system has proved itself so effective and economical that it is considered absolutely essential to operation.

A GAIN IN SCHEDULE SPEED IS MADE POSSIBLE

On account of the telephone dispatching, cars can be scheduled at a higher rate of speed, probably as much as 10 per cent higher, because no allowance need be made for such delays as may be called frequent, but not regular. Cars must report to the dispatcher each trip, so that by the omission of a report the dispatcher knows of any delayed cars in sufficient time to take steps to take care of the break in schedule.

As a telephone report, unless it is a special report, requires only about five seconds to transmit, the time for reporting does not affect schedules. Then, too, a trainman will be more conscientious about being exactly on his schedule time when he knows that the fact of his arrival at a definite point is being recorded.

If schedules are slow enough or have sufficient layovers to allow for the worst conditions that frequently occur, it requires additional cars, and if some of the delays provided for do not occur, the service is too slow to be attractive. It is therefore more economical to provide for as fast a schedule as can be maintained on the average and to provide a quick and effective means of correcting the service when delays occur.

INSPECTION SERVICE MADE MORE EFFICIENT

By the use of the telephone, the effectiveness of the supervision of inspectors is greatly improved and the cost of supervision reduced by at least one-half. The experience of inspectors on a line where there is no telephone dispatching is that they must station themselves at some location to check the cars as they pass. If something goes wrong, they do not know it until cars fail to show up. Then they do not know what is wrong or where it is, but must start a search for the trouble. After finding the trouble, they are usually so busy getting the trouble remedied that they cannot give attention to resuming service with other cars available that are not in trouble. And even after the trouble is cleared, it is difficult for them to get in touch with all of the cars in time to get normal service restored promptly.

With the telephone dispatching, every line inspector keeps in touch with the dispatcher so that the dispatcher can get him very promptly. The inspector, knowing the dispatcher will notify him of trouble, can give his full attention to instructing and assisting the men on the line. When trouble occurs, he learns of it much sooner, and when he does learn, he has complete information. When he arrives at the location, he can give his entire attention to clearing up the trouble, because he knows that if he gets the cars moving the dispatcher will take care of the work of restoring the schedule. With the telephone dispatching, if the trouble is serious, several inspectors may be sent from other lines, who would never have known of the trouble in any other way.

Supervision, thus economically controlled, can be handled with fewer inspectors because one inspector can handle several lines in the same territory.

If an inspector were assigned to each line in San Antonio, it would require thirty-five inspectors, on nine-hour shifts, not including any general inspectors in the downtown district. With the telephone dispatching, the work has been so combined that we are using only nine regular line inspectors, including downtown inspectors, plus three dispatchers, and the cost of telephones is equivalent to the salary of only one inspector, so that there is an equivalent of thirteen inspectors with telephone dispatching, against thirty-five inspectors required to do the same work without the telephone dispatching.

PROMPT EMERGENCY WORK IS POSSIBLE

Reporting to the dispatcher is a mechanic, who is on duty at all times and has a small automobile equipped with minor wrecking tools. He is thus able at short notice to take care of autos stuck on the track as well as minor accidents to and breakdowns of defective cars.

A messenger for carrying transfers and change and for relieving conductors of articles found on the cars is also kept on duty at all times in the dispatcher's office for the convenience of crews, and his work is directed by the dispatcher. The two men in this service are trainmen retired from active road service.

A wrecking car is kept at the carhouse for major accidents and can be summoned by telephone. During regular working hours for linemen, the emergency tower wagon and crew are employed at all times in regular work, but they maintain close contact with the dispatcher so that they may be dispatched to trolley breaks without delays. Track and switch repair men maintain contact with the dispatcher for the same purpose.

Before the telephone dispatching was installed, both a line crew and a track trouble man were constantly on duty awaiting emergency calls. The fact that a trainman must call up the office makes it very easy for him to report defects in cars, overhead, track or other equipment. This encourages him to report minor defects in time to save major ones. Otherwise a trainman must remember the defects he has seen and make a special effort to report them after he is off duty. Even the most conscientious man will often be so interested in getting home after his work that he will forget to make such a report, or hope that some one else will.

Reporting accidents to the claim department is one of the most important functions of a trainman. There is no way to estimate the help it is to a claim department to have a definite report on all accidents, no matter how slight, within at least one hour of the time that it occurred and averaging within twenty minutes from the time it occurred. Of course, major accidents, wherever they occur on the system, are reported immediately.

MANY OTHER ADVANTAGES

There are many little ways in which telephone dispatching has proved valuable, such as locating lost children quickly, reporting the loss of valuable articles, answering exaggerated complaints on service, and many other things too numerous to mention.

To sum up the whole situation, the San Antonio Public Service Company feels that telephone dispatching gives that close personal touch to the control of its car operation that is necessary to efficient management. The company learns of troubles in time to take action. It is convinced, after ten years of operation, that telephone dispatching is necessary for the most efficient and economical operation of street cars.

Interurbans Co-operate with Independent Bus Lines

BOTH the Interstate Public Service Company and the Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., have made contract arrangements with independent bus operators for certain co-ordinated transportation services.

The Indianapolis & Cincinnati Traction Company has two lines out of Indianapolis, one of which terminates at Rushville, Ind., and the other at Greensburg, Ind. Through rates with the interurban line have been established with a bus company operating beyond Rushville to Brookville, a distance of 32 miles. A similar arrangement has been made with a bus company whose line extends approximately 25 miles beyond Greensburg to Versailles.

The joint transportation arrangements were made with the distinct understanding that operation of the buses was to be continued throughout the winter without interruption if physically possible. These two bus lines brought 332 interchanged passengers to the railway during the month of December. The bus lines make connections with the railway and a joint timetable has been issued. Arrangements are also now being negotiated with these bus operators to extend the railway company's freight service to these same points by means of motor trucks.

In making arrangement to thus extend its services the railway selected the best of several bus operators running buses out of Rushville and Greensburg and made a contract terminable on thirty days notice by either party and providing for a settlement of revenues once a month. Both railway and bus operators report the arrangement to be very satisfactory thus far, new business coming to both as a result of the co-ordination.

The Interstate Public Service Company has made arrangements with a truck company to handle electric railway freight between Seymour, a town on the interurban line, and Brownstown, a distance of about 15 miles. A joint through tariff has been issued between points on the truck line and points on the railway line. This is said to be one of the earliest issues of such joint tariff.

Akron's "Rubber Urge" Passes

Street Cars Resumed Operation Feb. 28 Under Better Rate of Fare—Full Statement of Settlement Given —Vote on Permanent Franchise Nov. 4—Entire Controversy Reviewed, with Expressions of Opinion on Necessity for Cars by Various Civic Organizations

AKRON is riding to work again—riding in comfort and with complacency—and riding on street cars. There will be no more guessing for a time at least—if ever—on the part of the local public as to what the next day will bring forth for them in a transportation way, for on Feb. 28 the Northern Ohio Traction & Light Company resumed full service on its railway lines and its bus routes. A month of service with nondescript autos operated by ambidextrous drivers has done more toward restoring the rule of reason than six years of talk. The politicians are penitent and pensive. The public is pleased. Akron has been riding "exclusively" on rubber since Feb. 1, but its ride was not very resilient.

The agreement under which the cars and the buses of the railway were returned to service was reached late on Feb. 27. A temporary franchise has been granted to continue in effect until May 1, 1925, pending negotiation of a permanent grant which will be drawn and submitted to popular vote on Nov. 4. Until Dec. 4 the fare is to be 5 cents with 1 cent additional for a transfer. If the grant is defeated when submitted to the public the fare is to be 6 cents with a free transfer after Dec. 4 and until May 1, 1925.

The company has agreed to keep the paving between its tracks in good repair and to pay the paving costs on West Market and Bowery Streets, and also to pay a portion of the cost of East Exchange Street viaduct. But if the permanent franchise is not granted the city agrees to reimburse the company on all these payments made.

An audit of the company's books is to be made by a reputable firm before Oct. 1 and is to be made public. If the company and city cannot agree on an auditor, one is to be appointed by Federal Judge D. C. Westenhaver of Cleveland.

All buses now operating in competition with the railway are to cease operation within sixty days. The two franchises granted last week to the Mueller Brothers and Zeno Transportation Company are revoked, but both companies will be permitted to operate on the routes over which their buses ran prior to Feb. 1, as these routes are not in competition with the lines of the railway. It is said the city has had all the motorization it wants and no difficulty is anticipated in preparing a new permanent franchise to cover the period after Dec. 4, 1924. There is nothing in the franchise which contemplates a later motorizing of the city after the November election in event of failure of the franchise to pass. In fact the city expressed itself at the conference that no such attempt would be made.

The franchise passed by the Council received the favorable vote of every member and the immediate approval of the Mayor. The franchise is also meeting with the approval of the majority of the public. It revokes the ouster ordinance of Jan. 15 and requires the withdrawal of the 7-cent rate filed by the company with the Ohio Public Utilities Commission Jan. 3.

The company is to make a number of bus extensions and will purchase twenty new buses for the purpose. Altogether, the company agrees to make expenditures amounting to between $350,000 and $400,000 in paving charges, construction and new buses. The agreement in full is printed on page 334.

THE WHOLE STORY IN BRIEF

For six years the Northern Ohio Traction & Light Company has been endeavoring to secure a new contract in Akron, but always that intangible thing called politics has stolen in at the eleventh hour to block progress. Again and again the company has shown the necessity for transportation development in the city and pointed out that real progress along these lines could not be made in view of the uncertainty surrounding the action of the city when the old contract expired. Several times an agreement was reached, and three years ago a service-at-cost franchise was agreed upon, printed and circulated, only to be kicked over by political bosses at the last minute.

It is just twenty-five years ago this month (March) that the city of Akron made a contract with its street railway to carry passengers inside the city limits for a 5-cent cash fare, six tickets for 25 cents, or twenty-five tickets for $1. The grant was to run until midnight Jan. 31, 1924, with service providing a ten-minute headway from 5 a.m. until 10 p.m., and a twenty-minute headway from 10 p.m. until midnight. The contract, like most others of its kind, provided that the company should pay for paving between the rails and 1 ft. on each side.

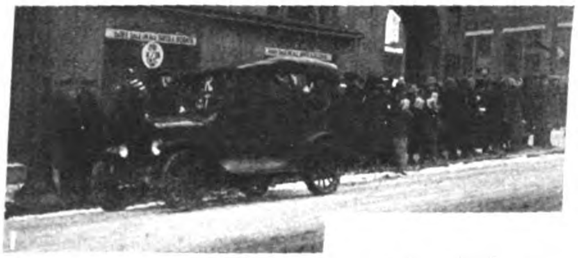
In July, 1920, Akron passed an emergency ordinance abolishing the ticket rates for a period of three months. Additional ordinances of a similar nature carried the rate until August, 1922, at which time the question of abolishing the ticket rates for the remaining period of the contract was submitted to a vote of the people. This proposition carried with it the right to operate a new railway line over North Main Street and the establishment of certain additional bus lines, the railway having already established two bus routes. This proposal carried by a vote of three to one. It provided a total of approximately 70 miles of rail lines and 25 miles of bus lines. Free transfers were issued between the rail lines and the bus lines operated by the company.

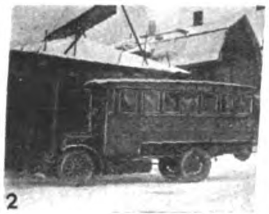
Approximately 200 street cars, largely of the Peter Witt type, and thirty modern steel-body buses were required to fill the schedules.

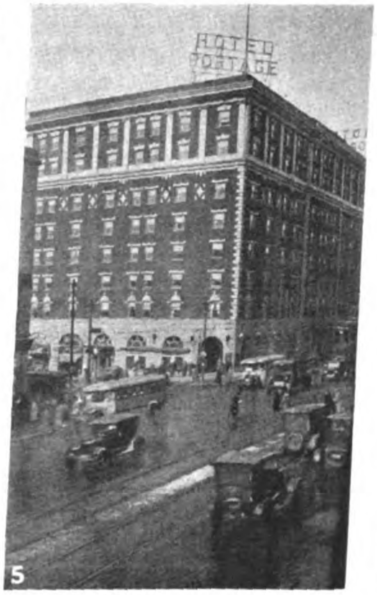
The relief granted the company by the city followed the defeat in 1919 of a twenty-five-year franchise, fixing the fare at 6 cents with free transfers. This was known as the Morse-Witmer proposal. It lost by a vote of six to one.

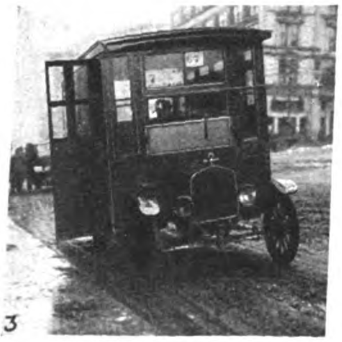
The Northern Ohio Traction & Light Company, which operates the Akron city system, city systems in Canton and Massillon, an interurban line from Cleveland to Uhrichsville, Ohio, a distance of 100 miles, and suburban lines from Akron to Ravenna, 20 miles, and from Akron to Wadsworth, 15 miles. The Akron city railway system is valued in excess of $7,000,000.

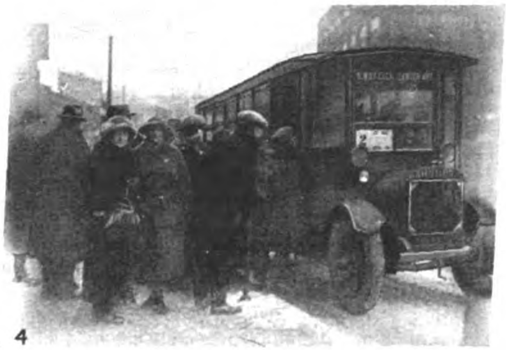
Snapshots from Akron, Taken While Buses Were Attempting to Provide the Local Transportation

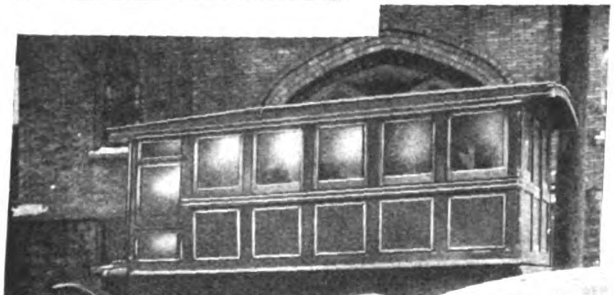

1

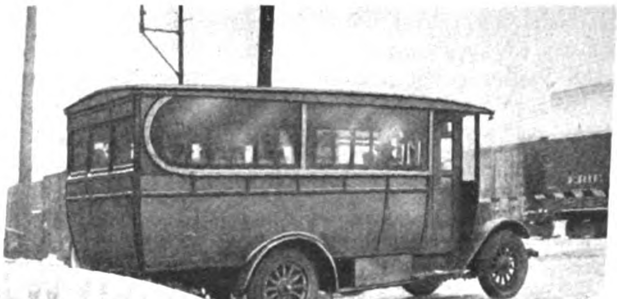

2


5

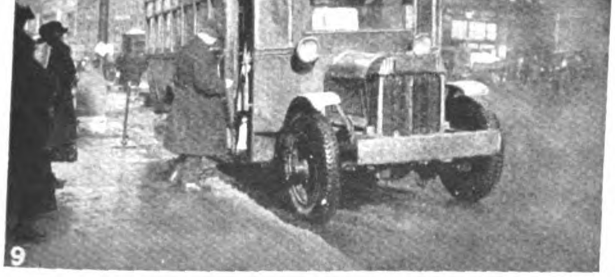

3


4


6


8

7


9

10

No. 1. Little groups like this waited in the bitter cold on many corners during midday for thirty and forty minutes.

No. 2. A bus from Toledo.

Nos. 3, 6 and 8. As in other cities when street cars have stopped, Akron has been the scene of operation of such vehicles as these.

No. 4. Crowding into a bus from Bay City, Mich., on South Main Street, Akron. This bus had no Ohio license during the time it operated.

No. 5. Two buses of the better type are seen at the intersection in front of the Portage Hotel.

No. 6. A relic carrying a New Jersey license, which found its way to Akron.

No. 7. Scene at 3:30 in the afternoon in front of the Portage Hotel.

No. 9. One of the better type buses which came in from an intercity route out of Columbus.

No. 10. Crowd on Main Street that refused to ride in the jitneys and waited one hour and three minutes for a bus at 3:30 p.m. Jitneys in operation in Akron were chalk marked on the back with a special number as may be seen in this picture.

This briefly presents the historical picture. The recital of these facts just at this point is regarded as essential in order that the reader may best interpret the more recent happenings. These had their setting in an educational campaign started six months ago in which figures were presented showing the actual cost of an Akron car ride to be 5.7 cents, excluding interest and depreciation. At the same time the company asked car riders voluntarily to pay 6 cents for their ride. Thousands responded to the appeal and the public was "sold" on the 6-cent fare.

About this time, the company having failed to get any definite co-operation in its movement for a new contract, a citizens' committee was organized. This committee was made up of 100 citizens representing various civic and improvement associations and women's clubs. The committee selected as its chairman Dr. H. S. MacAyeal, prominent in civic affairs for many years. The committee also named ten representative citizens from every section of the city to assist Dr. MacAyeal in his work of preparing a franchise to be submitted to the company and the city. The committee's work was wholly independent of both interests. Doctor MacAyeal spent several months in study and made a careful audit of the company's books. He visited various cities in the United States comparable in size with Akron and also some Canadian cities. The result was that the committee submitted a proposed franchise in January of this year, which had for its basic principle the Tayler grant now in force in Cleveland. The franchise further provided for the control of the transportation system by an independent board, thus taking the question out of politics. It provided no rate of fare, but suggested a property valuation of approximately $6,000,000, the construction of several miles of additional railway lines and the establishment of several other bus routes.

The proposition was looked upon favorably by the public and by the company, but the city refused to recognize it in any way. In fact, the Mayor even declined to present it to the Council.

It would now appear that back of the failure to bring about a settlement and adoption of a new contract for the continuation of a combination electric railway and bus transportation system was the desire to make Akron an exclusive bus transportation city, at any cost.

On Jan. 4, the day following notification from the street railway that it had filed with the state utilities commission a "rate of 7 cents cash, four tickets for 25 cents, on the Akron city system," Mayor D. C. Rybolt in a public statement declared he would supply Akron with "the finest bus transportation system in the world by Feb. 1, at a 5-cent fare, with free transfers."

In this connection it should be here stated that the Northern Ohio Traction & Light Company, through A. C. Blinn, vice-president and general manager, notified the Mayor and the City Council by letter on Jan. 3 that it had filed the proposed rate that day with the commission, as required by law. He added:

"We are very desirous of negotiating with the city for a new franchise, and the filing of these rates is in no wise intended to mean that the company is not willing at all times to negotiate for a contract determining rates and other conditions under which transportation may be furnished."

The letter carried a statement showing the company had lost $80,817 on its Akron city lines in the last year, excluding interest on the investment. Subsequently the city asked the company to continue operation on a 5-cent fare for a period of ninety days while a settlement was being negotiated. On its part the company offered to continue on a straight 6-cent fare with free transfers. The city rejected this offer and passed an ordinance ousting the company from the streets on Feb. 1, unless it agreed to the city's 5-cent demand within six days. The company immediately notified the city it could not operate on the 5-cent fare with free transfers, as required under the ouster ordinance. The city "stood pat" and the company was forced to abandon both its rail and bus service on Feb. 1.

That ended the first chapter!

Immediately following the passage of the ouster ordinance, H. S. Firestone, president of the Firestone Tire & Rubber Company, published a statement in which he said:

"As to motorizing the city, this can and will be done, to the great advantage of the citizens of Akron. We all realize that progress is only made by hard work and sacrifice, and naturally to make progress in this line we must expect to make some sacrifice until service is properly organized and on an efficient and economical basis. No city in the world should be more willing to make this sacrifice and demonstrate the economical and efficient basis of bus transportation than Akron, as its prosperity is based on the prosperity of highway and motor transportation."

The next day Mayor Rybolt issued a similar statement. He said:

"Akron is the tire capital of the world—if there is any place in the country where bus transportation should be a success it is in Akron. We certainly can afford to give bus transportation a fair try-out. It has proved a success in other cities and the successful operation of buses here will benefit every citizen of Akron, as the progress of the community is linked with the development of the tire industry. It is not only this city but many cities that are watching us. It will mean a great thing for Akron, for the rubber industry and for the automobile industry."

Other political leaders took up the cry, one local member of the State Legislature writing:

"Akron will lead the world as the first large city to completely motorize its passenger transportation service."

So Akron was "completely motorized"!

The first day under fair skies, clean streets and balmy atmosphere "the finest bus transportation system in the world" consisted of fifty-seven (exactly) varieties, mostly dilapidated buses from Plum Island Beach on the east, Saginaw on the north, Toledo on the west and Hicksville, Ohio, on the south. Newspapers ridiculed the attempt and there were pertinent inquiries in the press as to when the 250 double-deck buses the Mayor promised would arrive. Such queries brought a statement from Mayor Rybolt that double-deck buses "would not be feasible, because of Akron's hills." The railway had been saying the same thing for a long time.

For ten days the industrial workers took the situation good naturedly. The cars will soon be running, they said, at a 6-cent fare. Then came a blizzard from the west. Sleet and snow with the temperature near zero and a cutting wind! That was another story. A few additional buses came in, bringing the total to sixty-three. There was much suffering. Councilman Rose made a statement in Council disclosing the fact that 142 cases due to exposure waiting for buses were in the City Hospital. The storm kept gathering.

The Women's Federation called off all night meetings because their members "could not trust the bus service and would not be subject to conditions under which they would be forced to ride." The Central Labor Council adopted a resolution demanding a "return of the street cars on a 6-cent fare." Civic associations followed with like resolutions, as did the Hotel Men's Association, the Clearing House Association and various other associations. Petitions signed by 32,000 voters asked the return of street cars at a 6-cent fare.

Then the retail merchants took a hand. A resolution adopted unanimously by them follows in part:

> We believe that Akron should be served by a responsible transportation company, capable of supplying a reasonable service, and one from whom damages can be collected.
>
> We believe that the bus system as now operating is inadequate in regard to the above-mentioned particulars.
>
> We believe further that, pending negotiations which will result in a permanent contract with some reliable transportation company, this city should take steps to allow the Northern Ohio Traction Company to operate its cars and buses at a six-cent (6c.) fare with universal transfers for a reasonable period of time, which will relieve the citizents of Akron from an intolerable situation, and will enable the city administration to enter into negotiations with reputable companies who can furnish the necessary capital, equipment and organization to give Akron the kind of service it requires.
>
> We make this request not alone on account of the serious losses incurred by us as merchants, but because we believe it in the best interests of all the citizens in Akron to have immediate resumption of car service.
>
> In this connection, we would remind you that if this situation is prolonged it will become necessary for us greatly to curtail our expenses, resulting in a hardship for many men and women who may be deprived of employment.
>
> We believe that a permanent contract with some reliable transportation company should and must be entered into, but we do not admit that to do this it is necessary to submit to the disorganized and intolerable condition under which we are now living.
>
> We are unanimously agreed that the cars and buses of the Northern Ohio Traction Company should be allowed to operate immediately, pending negotiations which will lead to a permanent franchise.

The Lloyd Shoe Company was the first to announce in newspaper advertisements that it could not stand the strain. It said:

"We weathered the slump in business; we have weathered many storms, but we cannot weather the losses due to the abandonment of car service. We will sell our stock at cost and quit business."

The Noble-Carney Furniture Company, one of the oldest furniture houses in the city, announced an auction of its stock, saying:

"Women won't come downtown in buses. They constitute 90 per cent of our trade. It's bankruptcy for us if it continues. Twenty-three more days and we will be broke. Business is sick due to 'exposure and lack of nourishment,' due to our transportation problem. The reason is plain."

Other merchants carried advertisements saying:

"We do not ask you to come downtown under present conditions. Telephone us and we will deliver you what you want."

Two days after the merchants acted the Chamber of Commerce addressed the Mayor and the City Council as follows:

> In our opinion the welfare of Akron requires a system of transportation probably a combination of electric and bus, reaching every section of the city, on which will be charged one fare with free universal transfers.
>
> After careful investigation, we are confident that no figures based on facts can be produced showing that city-wide transportation can be furnished today with bus or electric line for 5 cents with free universal transfers.
>
> We know that many people in Akron are now paying much more than a 6-cent fare for transportation.
>
> In our judgment, the present experiment will materially retard the increased use of the bus transportation, and will therefore be extremely detrimental to the best interests of Akron and the world's rubber center.
>
> This chamber, therefore, strongly recommends that the City Council take the necessary action to bring immediate resumption of railway service on the basis of a 6-cent cash fare, with universal transfers, under a temporary agreement to last until Dec. 31 of this year, and that it further proceed at once to prepare a franchise for city-wide service, which franchise should be submitted to the people of this city for approval at the earliest possible date.

To all these pleas Mayor Rybolt and seven of the eleven Councilmen turned a deaf ear. They did, however, give some consideration to a new proposal last week from Mr. Blinn for the company. This provided:

1. A 5-cent fare with 1 cent transfer for sixty days.
2. An impartial audit of the company's books during that period.
3. A rate of fare not to exceed 6 cents with free transfer to be in effect until a permanent franchise is agreed upon and adopted by the people, provided an audit discloses that the company is entitled to a higher fare.
4. Elimination of jitneys on all competing rail and bus routes after sixty days.
5. Arbitration on all disputed points.

This offer, however, the Council rejected and passed two bus franchises to become effective in thirty days, one to the Zeno Transportation Company and the other to the Mueller Brothers Transportation Company, both of which have been operating for the last three or four years on routes not in competition with the railway.

This was after Council failed in an attempt to railroad through a bus franchise to the Akron Transportation Company, providing for 5, 6 and 10-cent fares immediately, based on the service-at-cost plan.

After the negotiations for the settlement had been concluded H. S. Firestone, one of the leading supporters of Mayor D. C. Rybolt in his motorization plan, said that he had frequently been misquoted as to his position in regard to motorizing Akron and the difficulty that has existed between the city of Akron and the Northern Ohio Traction company. He has explained that he made every effort within his power to have the street cars continue in operation and an amicable adjustment made between the city and the traction company. However, when it became evident that the street cars would discontinue to operate Feb. 1 he felt as a citizen of Akron that it was his duty to use whatever means were at his command to help Firestone employees and other citizens of Akron secure transportation in the crisis and he had 200 Ford cars brought into Akron and offered them to the city or to anyone to operate for the benefit and welfare of the people of Akron. He said: "I never have had and have no intention now, of organizing or financing a transportation company."

Mr. Firestone considers the fundamental basis of the new franchise fair and equitable. In regard to the future of the motor bus Mr. Firestone said:

"I am a firm believer in automotive and highway transportation and expect that buses will replace street cars in response to the growing demand for economy of time and relief from traffic congestion. However, I feel that this should come through properly organized channels such as the traction company and I hope that some amicable and fair basis may be found. Until then, I feel it my duty to be of whatever help I can to give Akron the best transportation under the existing conditions."

Full Text of Ordinance Under Which Northern Ohio Traction & Light Resumed Service in Akron

ORDNANCE No ——— contracting with the Northern Ohio Traction & Light company for the transportation of persons for hire in electric street railway cars and in motor buses at a fare of five cents (5c.) with one cent (1c.) for transfers, on certain streets of the city of Akron, for the period ending May 1, 1925, and repealing Ordinance No. 55— 1924 passed Jan. 15, 1924.

Whereas under Sec. 3, 4 and 5 of Article XVIII of the Constitution of Ohio, municipalities have the right to enter into contracts by ordinance for the service of public utilities, and,

Now, therefore, be it enacted by the Council of the city of Akron:

Sec. 1. That the Northern Ohio Traction & Light Company is hereby granted the right and privilege of operating its street cars in the city of Akron on all of the streets where said company has its rails and tracks now laid.

Allows 5-Cent Fare

Sec. 2. Said the Northern Ohio Traction & Light Company shall be entitled to charge and collect a fare of five cents (5c.) for each passenger carried, and may sell tickets in such lots as it deems advisable at the rate of five cents (5c.) for each ticket. The payment of such cash or ticket fare and the payment of one cent (1c.) for a transfer, when transfer is required, shall entitle the passenger to one continuous ride from any place in the city of Akron on said system to any other place in the city on the lines of the grantee's tracks or buses, provided that but one transfer charge shall be made for a continuous ride; provided further that any transfer issued as herein provided shall be used by the passenger on the next car or bus leaving transfer point after the passenger's arrival at such point, except and provided only that the company shall not be required to issue transfers entitling passengers to ride upon a car or bus substantially to the point of boarding the car or bus upon which the fare was paid or transfer issued; said rate of fare to continue until Dec. 4, 1924.

Sec. 3. Children five years of age or under, when accompanied by an adult, and all policemen and firemen of the city in uniforms, shall be carried free.

To Control Routing

Sec. 4. The motor bus lines as operated by said company on Jan. 1, 1924, shall be continued with the same rate of fare as that for street cars, and the same transfer charge, and the city by and through its Council and the Mayor, shall have the control of the routing of cars and buses and the determination of the transfer points, except that the transfer points and the routes of cars in effect on Jan. 31, 1924, shall continue, unless changed by consent of both parties.

Sec. 5. The schedule and service shall be adequate for the needs of the public, and shall be at least as frequent and as good as the service furnished by said company in the month of January, 1924.

Sec. 6. The company shall install extensions of bus service from the end of the company's present railway lines on Wooster Avenue, westerly on Wooster Avenue to East Avenue, and southerly on East Avenue to West South Street, and on Main Street from Steiner Avenue south to Firestone Boulevard. The easterly terminus of the company's crosstown bus line shall be Martha Avenue and East Market Street, and the westerly terminus of the company's South Maple Street bus line shall be Hawkins Avenue.

Helps With Paving

Sec. 7. The company shall lay new ties and rails and pay in installments as assessed, its proportionate cost of paving on West Market Street between West Street and Marvin Avenue, and on Bowery Street, when and if said streets are improved by the city during the term of this grant and prior to Dec. 4, 1924, the company's part of said paving to be the part between its tracks, the devil strip and twelve inches on the outside of the outer rails, and its reasonable proportion of the cost of the East Exchange Street viaduct, as and when such assessments and installments are payable; provided however, that in the event a permanent grant or franchise is not made by the city of Akron to the company for the right to continue the operation of a street railway and bus system in the city of Akron, on or before the fourth day of November, 1924, and accepted by the company, then the company shall be relieved of any and all assessments and payments for each and all of said improvements, and the city shall be liable to and shall reimburse the company for all payments which may have been made by the company on any of said improvements. The company shall maintain its tracks and the paving between these tracks in good repair.

Ouster Ordinance Repealed

Sec. 8. Ordinance No. 55—1924, passed on the 15th day of January, 1924, entitled "Ordinance No. 55—1924, requiring the Northern Ohio Traction & Light Company to cease operating its cars on Feb. 1, 1924, and to remove its tracks, etc., unless it notifies the city of its willingness to operate its street cars at said time at a 5-cent rate of fare," be and the same is hereby repealed.

Sec. 9. The city and the company shall immediately begin negotiations for a permanent grant or franchise from the city to the company for street railway and bus service, and if the city desires for the purpose of such agreement, the city may ask an audit and analysis of the company's books pertaining to the operation of street railway and bus service in the city of Akron for the year 1922, 1923 and any succeeding period, and an appraisal of the company's railway and bus property used and useful in its Akron City System, which audit and analysis shall be completed and made public not later than the first day of October, 1924. Such audit, analysis and appraisal to be made by certified public accountants and engineers of recognized standing, to be agreed upon, and if the city and the company are unable to agree, then said accountants and engineers, shall be selected by Federal Judge D. C. Westenhaver, or his successor. Such proposed franchise, if submitted to an election, shall be submitted not later than the November election, 1924.

Six Months Longer

Sec. 10. In the event a permanent grant or franchise does not become effective on or before Nov. 4, 1924, then the company shall, upon the city's request, continue operation of said street railway service and bus service from Dec. 4, 1924, until May 1, 1925, and shall be entitled to charge and collect a reasonable rate of fare to be determined by the audit, analysis and appraisal provided for herein, but not to exceed six cents (6c.) with free universal transfers.

Sec. 11. The city reserves the right to prescribe the form and manner in which the records and acounts of the company relating to its Akron city Street Railway and Bus System shall be kept; and shall have the right to audit, examine, make and keep copies of such records and accounts and to require from said company, detailed reports at any time relating to the finances, operation, management and ownership of said company and its said property; provided however, that the form of accounts which the state public utilities commission may prescribe, if lawfully applicable hereto, shall be controlling insofar as they go, but the council may prescribe more detailed forms and exact more comprehensive reports than is required or stipulated by said state commission.

Assumes Responsibility

Sec. 12. The said company assumes and shall at all times assume full responsibility for the operation of its said cars and buses upon said streets, and it shall save the city harmless against all loss and liability for any and all claims which may arise for injury to persons or property of the company pursuant to this contract.

Sec. 13. All of the terms, conditions and provisions of the charter of the city of Akron relating to franchises and applicable hereto, are and shall be considered as a part of the terms and conditions of this ordinance as if the same were fully written herein, and this ordinance not to be considered as an exclusive franchise.

Right to Purchase

Sec. 14. The city of Akron shall have the right and option, at the end of the third month period, to purchase, or lease the property of said company used or conveniently useful, for the transportation of passengers under this contract, provided the city, not less than one month prior to said date, by ordinance, notifies the company of its desire to make said purchase or lease; and provided further, that the price to be paid by the city shall exclude all value of this grant, extension or renewal. In case the city desired to make said purchase, the price to be paid by the city to the said company shall be agreed upon between the parties hereto, but in the event of the failure to agree, the said price shall be determined and fixed by arbitrators, to be appointed as follows: Each party (the Council acting for the city) shall choose an arbitrator, and the two thus chosen shall choose a third arbitrator, and upon failure for five days to agree on the third arbitrator, the Federal District Judge, D. C. Westenhaver or his successor, shall appoint said third arbitrator, and said board of arbitrators shall make a valuation of the property of said company used and useful in carrying out this contract, which valuation shall be made within thirty days after they are chosen. The party choosing an arbitrator shall pay the compensation and expenses of said arbitrator, and the compensation of a third arbitrator, together with the expenses of the investigation, shall be borne equally by the parties. Within three months after said value shall have been agreed upon or fixed as aforesaid, the city of Akron shall pay the amount thereof to the company in cash, wherupon the city shall be entitled to have conveyed to it, and shall be given possession of said property.

City to Pay Costs

The City Council may refuse to be bound by the price fixed by the board of arbitrators, in which event the city shall pay the total cost of said arbitration, including the compensation of the arbitrator appointed by the company, and no further proceedings shall be had under said notice to purchase.

In the event the city desires to lease said property, within thirty days after the said rental price shall have been agreed upon or determined by arbitration, as provided herein, the parties shall make a lease, letting to the city said property for the balance of the term of this contract, and binding the city during said term to pay to said company the rental in monthly installments in advance.

Sec. 15. The motor buses put into operation upon the streets of the city on and after Feb. 1, 1924, and any buses now in transit or en route to the city of Akron to be placed in such operation, shall not be permitted to operate for a longer period than sixty days from the passage and approval of this ordinance.

Routing of Buses

If any vehicles carrying passengers for hire, taxicabs excepted, are permitted to operate in the city after April 28, 1924, the same shall be routed by the proper city authority, so as to exclude their operation upon any or all streets occupied by the street railway tracks and street railway bus lines. Nothing herein shall in any way affect the operation of the motor buses which were being operated in the city under Ordinance No. 8357, prior to Feb. 1, 1924. Motor buses as used in this ordinance shall mean vehicles with a seating capacity of ten or more passengers.

Sec. 16. This ordinance shall not become effective unless and until the said Northern Ohio Traction & Light Company shall have withdrawn the rate schedule filed by it with the Public Utilities Commission of Ohio on Jan. 3, 1924, wherein said company declared its intention to charge seven cents (7c.) cash fare, four tickets for a quarter, on or after Feb. 1, 1924, and this ordinance shall not become effective unless the said the Northern Ohio Traction & Light Company shall in writing accept the same within one day after the said ordinance shall have been passed and approved, or if not approved by the Mayor, shall have been duly passed over the Mayor's veto, as provided by the charter of the city of Akron.

Contract to be Void

Sec. 17. Upon failure of said company to carry out and comply with all the provisions of the foregoing ordinance as its part, this contract shall be null and void.

Sec. 18. This ordinance shall not be effective until accepted in writing by the Northern Ohio Traction & Light Company within one day after its passage and approval, otherwise the same shall be null and void, and this ordinance shall take effect if accepted, as aforesaid, at the earliest date allowed by law, and shall continue for the period ending May 1, 1925.

Bus Competition Ends at Wheeling

Independent Bus Company and Wild-Cat Operators Competed on Interurban Runs for Two and One-Half Years—Bus Service Finally Suspended Thanksgiving Day —Its Effect on Wheeling Traction Company Analyzed

ONE more chapter has been added to the already long story, and again it has been proved that, in general, local transportation services cannot successfully compete, but that in their nature they must be monopolies and properly co-ordinated.

Buses first appeared in competition with Wheeling Traction cars on March 12, 1921, and last turned their wheels on Nov. 25, 1923. From a maximum of twenty-five buses in operation in the summer of 1921, the competition gradually dwindled down, until but five remained during the last few weeks before a receivership ended the whole demonstration.

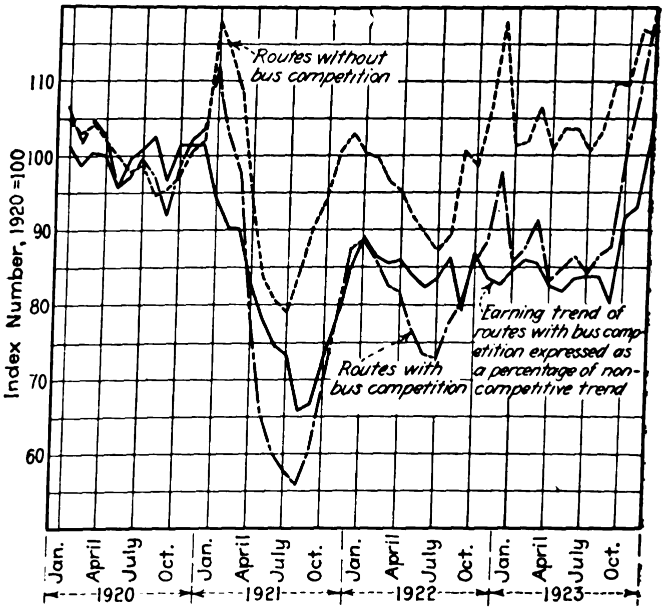
The buses started as a result of a chain of circumstances that seemed to invite uninitiated operators to enter the business. Wild-cat jitneys in many parts of the country apparently were doing well. Up to that time neither Ohio nor West Virginia had attempted to regulate bus transportation or protect the existing agencies of travel. The Wheeling Traction Company had made an increase in fares in December, 1920, which, though not large, involved re-zoning of the system and naturally changed the accustomed fare limits of the riders.

The business depression, which had been creeping upon the country since the summer of 1920, reached Wheeling early in February, 1921, with unusual suddenness. The steel mills promptly shut down and men were thus out of their own work. The buyer's strike which precipitated the slowing down or hesitation in business produced a near panic among the merchants. Automobile and truck dealers in that district particularly were overstocked with equipment and parts and were obliged to find an outlet for their goods. Equipment was therefore offered on very favorable terms. Furthermore, many truck operators who had been making a fair living handling merchandise began to cast about for new business.

It is well understood that the electric railway's business does not fluctuate in such marked manner as the non-utility industries. Although the traction system suffered a loss in revenue of approximately 15 per cent, due directly to the business depression, no material change was made in operating schedules. The reduced riding was not sufficient to be noticeable to the casual observer. The bus promoters and jitney owners did not realize the true conditions and fancied that there was ample business to be had at the rates they proposed to make effective.

Wheeling is the center of an important industrial district. Within a half-hour ride are the principal towns of Benwood, McMechen and Warwood on the West Virginia side of the river, and Bridgeport, Martins Ferry and Bellaire on the Ohio side. The first bus placed in service was sponsored by a resident of Martins Ferry, who owned a garage and had had four years experience as a taxicab operator. The date of starting was March 12, 1921, and one Ultimate machine seating sixteen people was operated between Martins Ferry and Wheeling at a comparatively low rate of fare. From the standpoint of patronage the venture was an immediate success, and consequently a second Ultimate bus appeared on March 17. Thereupon the Ultimate Bus Company was organized and heralded as a savior of the common people from the "predatory" corporations.

The traction company had been misunderstood by town councils and the public generally in Martins Ferry and Bellaire because of efforts to secure franchises free from the burdensome requirements so common in the early street railway grants. The atmosphere was charged with a feeling of bitterness at the time, and the competition that was offered to rail lines was enthusiastically welcomed. Moreover, the bus company offered common stock to the residents of the towns served, and thus the people had the opportunity of participating in the management and expected profits of the business.



Index of Trend of Earnings, Wheeling Traction Company, Showing Effect of Bus Competition

OTHER BUS SERVICE STARTED

This apparent success encouraged other bus activities in and around Wheeling. Most of these, however, were of a makeshift character, using light, unsuitable cars. The equipment was inadequate and, with no definitely organized and scheduled routes, the competition between the buses themselves proved very destructive, so that only the strongest operators survived.

The traction company logically protested this uneconomic competition, but could not obtain the necessary protection under the prevailing laws or ordinances. It could not even prevent buses making their runs just ahead of the street cars in order to pick up waiting trolley passengers.

The good roads law of West Virginia, among other provisions, made it necessary before a bus could be operated over state highways that a certificate of public convenience be secured from the Good Roads Commission. This did not preclude city operation or interstate travel when West Virginia state highways were not used. Thus lines between Wheeling and Ohio points were outside the pale of authority of the Good Roads Commission.

For safety in travel and in order to equalize taxation an ordinance was passed by the city of Wheeling imposing a seat-mile license tax and requiring rear doors, specifying the routes and regulating the stopping points, but it did not prevent competitive operations. Unfortunately, the Ultimate Bus Company used Wheeling streets only as a terminal and very little of its mileage was inside the city, so that the city tax was not an effective remedy.

In the early stages of the competition there were certain clashes between the companies, due to disputed rights and privileges, but after the late summer of 1921 no further open conflicts were evident. The traction company realized that the traffic would not support both bus and rail services and therefore adopted the policy of giving the buses enough latitude to permit them to wear themselves out promptly.

By midsummer only the Ultimate Bus Company had survived under the rates of fare which had been inaugurated. The revenues evidently were not sufficient to pay expenses and satisfactorily maintain the equipment. After the disappearance of the "tramp" buses, operated by individual owners competing with each other and not attempting to cover specified routes or operate on definite schedules, the technical position of the Ultimate Bus Company evidently improved.

The traction service still attracted the major part of the riding, and as the first winter approached the buses became less and less popular. To any one acquainted with the transportation business, it was realized that the bus operations as conducted in the Wheeling district could continue but a comparatively short time. The buses were wearing out. During April, 1923, the bus company was operating fourteen buses, the maximum number which it ever operated. Six of these buses ran to Bellaire and six to Martins Ferry, while the other two were held in reserve. In July four were withdrawn from service, and shortly after the big Wheeling Fair in September the total number of buses remaining in operation was reduced to five. The service was finally discontinued entirely on Thanksgiving Day.

EFFECT OF COMPETITION ON RAILWAY EARNINGS

It is interesting to review the course of traction revenues during this period. To begin with, revenues were also affected by the general business depression of 1921 and again by the recovery in 1922 and 1923. During this time inroads obviously were made by the buses. The accompanying chart has been prepared using the revenue of 1920, a normal year, as a basis, subsequent monthly revenues being expressed as a percentage of the 1920 average to present a clear picture of the situation. Seasonal variations in revenues have been eliminated. As nearly as can be determined the traction loss is expressed by the difference in indexes between those lines which suffered through bus competition and those lines that did not, the latter being selected to get a fair comparison. Obviously in a case like this it is possible only to determine the loss with approximate accuracy, but it is believed that these two groups of route earnings would have closely followed the same trends except for the diversion caused by the buses.

The heavier curve shows that the routes affected have been operating at 34 per cent to 7 per cent below the otherwise normal, the average for the period being approximately 21 per cent. As but two routes were affected by the competing buses, the entire traction system lost only approximately 6 per cent of its revenue to the buses. The traction service was never reduced because of this lessened business, but as time went on it was gradually improved. At no time did the buses add a necessary service, so that the economic result was that the same amount of business was called upon to support the increased total cost caused by the added bus service. In other words, the operating expenses of the bus company were a dead loss to the community.

In December, 1922, the traction fare basis was changed. Up to this time the system had been divided into fifty-three short zones at 3⅓ cents each, with a minimum ticket fare of 6⅔ cents. The system had been designed especially to give the privilege of riding additional distances beyond the first fare unit at less than full fare zone charge; that is, while the first unit of fare was 6⅔ cents, all beyond that were at 3⅓ cents, which very closely approximated an ideal mileage or distance method of charging. Short zones, however, did not prove popular in this district. The new fare adopted in December, 1922, lengthened the zones, so that while the average rate per mile over the entire system was not changed, the fare unit for all zones was changed to 5 cents by ticket or 8 cents cash. In addition, reduced rate strip tickets, unlimited as to use, were adopted between Wheeling and some of the neighboring towns where the distances traveled by the majority of the people were apparently considerably less than full zone units.

Undoubtedly the reduced minimum fare and the reduced fare between Wheeling and Martins Ferry changed the sentiment on the bus situation. However, the fare element is not the sole factor in influencing riding, as the following experience on the Wheeling and Bellaire division demonstrates:

RELATION BETWEEN PATRONAGE AND FARES, WHEELING

		Index of Number of Patrons	Fare Between Wheeling and Bellaire, Cents
November,	1922	191	13⅓
December,	1922	231	13⅓ and 10
January,	1923	221	10
February,	1923	213	10
March,	1923	246	10
April,	1923	216	10
May,	1923	225	10 and 12½
June,	1923	221	12½

This case evidently offers further confirmation of the fact that buses and street cars cannot compete where either alone may successfully serve the traffic.

The laws have changed in Ohio and West Virginia since 1921, in that while buses which operated before the present laws were passed may still continue, no new routes may be started in either state without a certificate of public convenience. The day of the "wildcat jitney" is gone. The future offers possibilities for the bus, but it must be co-ordinated with other transportation facilities and economically suited for the service to be supplied.

Association News & Discussions

Insull Proposes Rapid Transit Plan

Would Build Extensions to Present Elevated System in Ten Steps and Finance Through Customer-Ownership Plan—Also Would Have City Build Subway for "L" Through Loop District

A PLAN whereby the city of Chicago would obtain additional rapid transit facilities through customer ownership was proposed by Samuel Insull, head of the elevated railroads, gas and electric utilities in Chicago, in an address before the Chicago and Cook County Bankers' Association on Feb. 21. These additional facilities are to be had by additions and extensions to the existing "L" lines which would provide a midcity cross-town main line straight north and south through the city's center of population, at Roosevelt Road and Ashland Avenue, extending from Seventy-fourth Street and Ashland Avenue to connections with the North Side "L" lines near Belmont Avenue. The cost is placed at $23,000,000, which, according to Mr. Insull, is a small amount when compared with what other public service companies have spent for extensions.

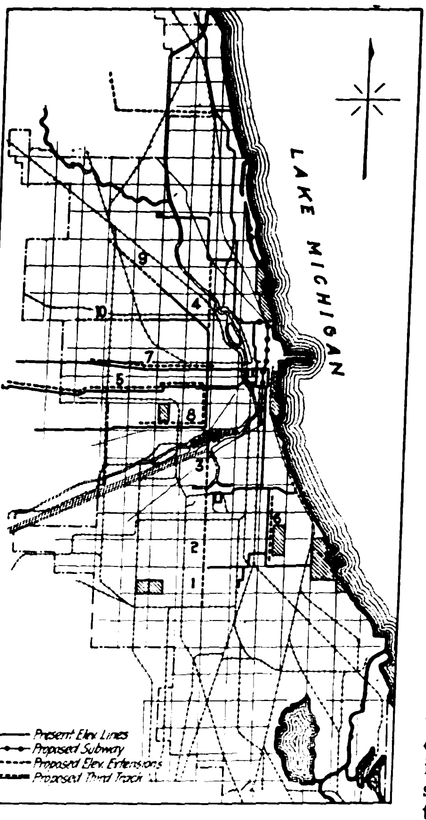
The financing of such a project was held to be feasible under a customer-ownership plan. Preferred stock of the reorganized Chicago Rapid Transit Company would be offered to the people, who will derive the benefit of additional service and the enhanced property values which will result from improved transportation. Adequate financial returns to the customer-owners is assured by the conservative capitalization of the Chicago Rapid Transit Company, which is less than the actual value of the company's property as appraised by the state utility commission.

In explaining the reason for the present traction situation and his proposed solution, Mr. Insull said:

"In the last five years there has been expended in public utility extensions, including the city's water works, the sum of $169,958,194. Of this vast sum $155,816,875 was provided by private enterprise for the extension of telephone, gas, electric and transportation service, the balance, $14,141,329, having been invested by the city of Chicago in its water supply system. These vast expenditures are all divided as follows:

Commonwealth Edison Company	$67,042,623	
Illinois Bell Telephone Company	50,770,776	
People's Gas Company	28,470,265	
City Water Works	14,141,329	$160,424.993
Chicago Surface Lines	$5,428,879	
Elevated Railroads	4,104,322	9,533,201
Total	....	$169,958.194

"Of the total amount spent, the surface and elevated lines spent only $9,533,201, or little more than 5 per cent, notwithstanding the pressing need and the constant demand for improved transportation. Why have the transportation needs of the city been neglected, while other utilities have gone forward to meet the growing demands on their service? There are many answers to this question—the increase in the cost of transportation as a result of the high prices of labor and material caused by the war; the fear of the investors as to whether the investment would be remunerative or not; short time or expiring franchises; to be candid, a lack of initiative in recent years on the part of the managements of both the elevated and surface properties, caused in no small degree by some of the foregoing reasons, but to my mind the greatest obstacle of all has been the continued maintenance of the traction question as a political issue.



Proposed Extensions to Existing Rapid Transit Lines, as Outlined by Mr. Insull

"The utilities outside of traction have not for a number of years been subject to any great extent to political agitation, but in one form or another the traction question has been a burning question in every local political campaign for years past. Extravagant and impossible promises have been made before election and very little, if any, really constructive work has been done after election.

"I am not a believer in municipal ownership or operation as a cure for the traction ills we suffer from. I do not believe that you can expect to overcome our present troubles by the removal of personal incentive or the abolition of business management and the inauguration in its place of political management.

"On the other hand, if the community wants municipal ownership, if the people desire to substitute political management in the place of business management, I believe in giving them what they want if a means can be found to do so. The task of finding such means is not mine. I propose to address myself this evening to pointing the way to the possible development of rapid transit facilities by the use of existing agencies, namely, the elevated railways and the employment of capital supplied by our own citizens for this purpose."

The following construction steps, and the estimated cost of each, to give to Chicago rapid transit facilities capable of handling 200,000,000 additional passengers a year were outlined by Mr. Insull. The extensions to the elevated system are indicated by corresponding numbers which are shown on the accompanying map.

Step 1	Extend Englewood branch, South Side, west to Ashland Avenue and south to Seventy-fourth Street; distance, 1½ miles	$1,500,000
Step 2	Build double-track line near Ashland Avenue connecting Englewood and Stock Yards branches South Side Elevated; distance 3 miles	3,000,000
Step 3	Build double-track line near Ashland Avenue connecting line built in Step 2 with Metropolitan Elevated Douglas Park branch near Twentieth Street; distance 2¾ miles	3,000,000
Step 4	Build double-track line near Ashland Avenue connecting Metropolitan Elevated Logan Square branch at Milwaukee Avenue with Ravenswood branch Northwestern Elevated; distance 2¾ miles	3,000,000
Step 5	Third-track Metropolitan Elevated Garfield Park branch from Marshfield Avenue to Forest Park; distance 7½ miles	2,500,000
Step 6	Third-track South Side Elevated from Forty-third Street to Sixty-third Street for express service; distance 2½ miles	2,000,000
Step 7	Complete the third-tracking of Lake Street line from Ashland Avenue to Laramie Avenue	800,000
Step 8	Third-track Metropolitan Douglas Park branch from Marshfield Avenue to Lawndale Avenue	1,800,000
Step 9	Extend Logan Square branch of the Metropolitan to Irving Park Boulevard; distance 2¾ miles	3,000,000
Step 10	Extend Humboldt Park branch of the Metropolitan west for 2½ miles	2,500,000
Total		$23,100,000

In addition to this contemplated rapid transit system, a north and south, four-track subway, owned and built by the city, would relieve the traffic congestion in the Loop, Mr. Insull said. He stated that the solution of the transportation problem in Chicago rests directly with the people of the community, and that customer ownership offers a method for speedily carrying out the much-needed extensions to the existing rapid transit system.

Electrification Standards Urged

STANDARDIZATION of contact line type and voltage for heavy railroad electrification was urged by W. S. Murray, consulting engineer, at a joint meeting of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers at New York on Feb. 27. Mr. Murray stated that while the direct-current motor at not more than 1,500 volts is most economical for motive power, the economies of the high-tension alternating-current overhead trolley system are too great to be overlooked. To use d.c. motors and a.c. line requires a conversion unit on the locomotive, which can be a motor-generator set. Experimental locomotives of this type are now being built, and it is hoped that they will furnish valuable cost and operating data.

The importance of having a uniform contact system was especially urged by the speaker, who felt that it is desirable to have an electric locomotive able to operate on any standard gage railroad track in the country, as a steam locomotive can do now. No electric locomotive of any one of the seven principal electrified lines, he stated, can be used on any of the others.

The possibility of increasing greatly the mileage of electric divisions was pointed out by Mr. Murray. An electric locomotive can operate as high as 6,000 out of the 8,760 hours in a year, while the steam locomotive can operate barely 3,000 hours.

On this basis the electric passenger locomotive can average 700 to 1,000 miles a day, and the electric freight locomotive 300 miles a day. The present steam freight locomotives, he said, average 55 miles a day.

The power requirements of electrified roads are very moderate, according to the speaker. One modern 60,000-kw. unit could supply the entire New Haven electrification with a good margin of safety, as the present normal load is approximately 35,000 kw.

Program of Wisconsin Association

THE tentative program of the Wisconsin Utilities Association's annual convention to be held at the Hotel Pfister in Milwaukee, April 17 and 18, has been sent out by John N. Cadby, secretary of the association. General meetings will be held in the forenoons, while the afternoons will be occupied with separate sessions of the gas, electric and railway sections. Speakers at the electric railway section will include: James C. Jamieson, Dayton Mechanical Tie Company; Francis Fox, Griffin Wheel Company; Dudley Montgomery, Madison Railways, and Andrew R. McDonald, member Wisconson Railroad Commission.

The annual dinner will be held on April 18. M. H. Aylesworth of the N.E.L.A. and E. F. Wickwire, Ohio Brass Company, will speak.

New England Club Meeting

THE twenty-fourth annual meeting of the New England Street Railway Club will be held at the Copley Plaza Hotel, Boston, Mass., on March 27.

American Association News

Special Pullman Booth at St. Louis

THE Southwestern Passenger Association will establish a special Pullman ticket booth in the lobby of the Chase Hotel, St. Louis, on March 3 and 4 for the convenience of those attending the Midyear Meeting of the American Electric Railway Association. Through this arrangement it will be possible to make full arrangements for the return trip without leaving the hotel.

Dr. Ely on Midyear Program

AT THE afternoon session of the Midyear Meeting of the American Electric Railway Association at St. Louis, March 4, in addition to the speakers previously announced on the topic "The Improved Condition of Electric Railways," Dr. Richard T. Ely, professor of economics at the University of Wisconsin, will consider the subject from the standpoint of the economist. Dr. Ely is head of the Institute of Land Economics, and is an authority of wide reputation on taxation problems and land values.

Way Matters

A LENGTHY discussion concerning the best method of securing a service test of various types of rail joints featured the meeting of the committee on way matters held at Easton, Pa., Feb. 13 and 14. Following a description of the tests which had been made previously, not including any service test however, E. M. T. Ryder described a new plan to secure data on the latter subject. The original plan was to construct a rotary service machine, and a machine of this sort had in fact been designed. But when bids were received from the manufacturers the cost of this machine proved greater than the sum available. Some doubt was expressed concerning the value of the information to be derived from the use of the machine and for that reason the matter had been allowed to rest.

The new plan suggested was to build a circular track 200 ft. in diameter and operate fourteen double-truck cars around the circle. The outer rail was to be the association standard grooved girder rail and was to have the proper elevation, approximately 9 in., for a constant speed of 15 m.p.h. The inner rail was to be plain T, with bolted guard rails on both rails. The inside and outside wheel diameter were to be arranged so that there should be no slippage. It was felt that if this was done it would be unnecessary to make the axles truly radial. The flange on the outer wheels was to be removed so that there should be no flange wear during the test. The committee discussed this subject at length, but its members were about evenly divided in their opinion concerning its feasibility and desirability and no definite action was taken.

The form of a questionnaire on substitute ties was determined upon after considerable discussion. It was decided to send this questionnaire to all member companies as well as to those railways which are known to be using various substitute ties.

A comprehensive statement covering the experience of the Toronto Transportation Commission with methods of surface hardening of rails was given by A. T. Spencer. Data were presented and some samples exhibited to show the practical application of the "in situ" process used in that city. Much information from other sources describing various processes and the results obtained was also presented by Mr. Spencer.

The committee decided unanimously to adopt the A.R.E.A. type of track spike as standard for the American Electric Railway Engineering Association. No definite action was taken in regard to tie rod specifications. The subject of narrow grooved guard rails was discussed, but the committee decided to lay the matter over until the next meeting. Final action on the standardization of frogs was also postponed until the next meeting. A progress report was made covering flange for manganese steel crossings, steam over electric railway.

The standardization of switches and mates was discussed, and a progress report submitted concerning gages and flangeways with their permissible variations and clearances. An interesting study was presented by E. M. T. Ryder on the subject of a standard switch tongue. He showed the dimensions of the various types now in use and suggested a method of standardizing. The committee voted to continue the study of this subject and requested all the manufacturers to co-operate in securing further data before the next meeting. Revision of existing specifications was briefly considered and it was suggested that proposed changes be submitted at the next meeting. It was decided at a luncheon at the Northampton Country Club to hold the next meeting in Baltimore on April 16 and 17.

During the afternoon of Feb. 13 the committee spent several hours inspecting the plant of the Wharton company. This proved to be both interesting and instructive. The entire arrangements for the meeting at Easton were in the hands of the officials of Wm. Wharton, Jr. & Company. The committee voted its sincere appreciation of the way that the arrangements had been carried out.

The members of the committee present were: W. W. Wysor, C. A. Alden, V. Angerer, S. C. Baker, E. B. Entwisle, R. B. Fisher, A. T. Spencer, H. H. Guillot, representing G. C. Estell; E. M. T. Ryder, C. F. Gailor and H. H. George, chairman.

Time for Answering I. C. C. Extended

THE time for filing an answer to circular No. 3 on depreciation of electric railway property issued by the bureau of accounts, depreciation section of the Interstate Commerce Commission, under date of Jan. 26, 1924, has been extended until April 6 (original limit March 6) at the request of the committee on national relations of the American Association.

Electric Lines File Depreciation Brief

American Electric Railway Association Committee Discusses Basic Questions of Useful Life and Depreciation Reserves Before the Interstate Commerce Commission

THE American Electric Railway Association was granted permission by the Interstate Commerce Commission to intervene in the proceedings under No. 15100, Depreciation Charges of Steam Railroad Companies, being a hearing before the commission on the recommendations of the bureau of accounts, depreciation section, with regard to the setting up of depreciation accounts by the steam railroad companies, and the action which should be taken by the commission in reference thereto under Sec. 20, Par. 5, of the interstate commerce act, as amended Feb. 28, 1920.

A committee consisting of W. H. Maltbie, chairman; R. R. Bradley, A. W. Brady and Frank Karr prepared a 4,500-word brief which was filed with the commission on Feb. 20. On account of the importance of the subject to the industry, the principal contentions in the brief are given below practically in full.

The conditions which surround the electric railway industry, although similar in some respects to those which surround the steam railroad industry, present nevertheless many points of difference, both as to the character of the traffic handled, conditions under which operations are performed, and relations of the companies involved to the general economic and financial situation in the country as a whole. Interest in the present case, therefore, is confined to the discussion of some of the general principles underlying a system of depreciation accounting, which by virtue of their general application might be applied in any subsequent cases relating to the accounting of carriers other than steam roads, and also because of the precedents established for subsequent cases before the Interstate Commerce Commission and state commissions.

No attempt is made in this case to file any full brief or complete discussion of the question of depreciation as applied to electric railway accounting. The present brief is intended only to cover a few general questions on principles which are so broad as to be of general application.

The recommendations made by the depreciation section, as the committee understands them, involve the division of the depreciable property of the carrier into two classes to be handled, respectively, on a unit and a group basis. For both classes depreciation is to be accounted for on the straight-line basis. Estimated useful life is to be determined with due allowance for possible retirement through obsolescence, inadequacy, changes in the art, and public requirements. These estimates as to useful life are to be made in the first instance by the Interstate Commerce Commission for the various classes of roads, and thereafter are to be subject to modification for individual lines in the discretion of the commission, on application by individual roads; and the corporations are to be under no restrictions as to the use which they shall make of the depreciation reserve.

In the case of property in the unit class the ratio of salvage to ledger value is to be determined by estimates, a separate depreciation account is to be set up for each unit, and if a unit is retired before the end of its estimated useful life the shortage in the depreciation reserve accumulated for that particular unit is to be charged to operation as of the year of retirement. If, on the other hand, the unit exceeds its estimated useful life, no further reserve is to be accumulated for it after the expiration of the estimated useful life.

In the case of property in the group class the ratio of salvage to ledger value is determined not by estimates but by actual average experience over the preceding period equal to the estimated life cycle, the reserve is set up for the group as a whole, and there is therefore no opportunity to determine whether a particular portion of the group which it becomes necessary to replace has or has not an adequate reserve accumulated for it; and there is therefore no opportunity or cause for charging into the operating expenses of any particular year any special deficits such as those which arise in the case of property handled on the unit system.

These recommendations raise, either directly or through conditions which inevitably follow their adoption, certain basic questions, on three of which the committee presented comments for consideration of the commission. These questions are:

First—Shall the useful life of property for depreciation purposes be estimated on the basis of normal exhaustion through use, or shall there be included the effect of possible retirement through obsolescence, inadequacy, changes in the art, and public requirements?

Second—Shall a depreciation reserve be set up on a unit basis, on a group basis, or as a single reserve for the composite property?

Third—Shall a depreciation reserve be built up for the purpose of ultimately refunding his investment to the investor, or in other words for the liquidation of the securities issued, or shall it be limited to the replacement of property which it becomes necessary to retire?

ESTIMATION OF USEFUL LIFE AND EFFECT OF OBSOLESCENCE, ETC.

Attention is called first to the fact that the inclusion in the determination of useful life of possible retirement through obsolescence, inadequacy, changes in the art, and public requirements has the effect of shortening the estimated life as compared with normal wearing life, and consequently results in an overcharge against the public during the earlier part of the life cycle of all property which lives out its normal life.

Retirement through obsolescence, inadequacy, changes in the art, and public requirements does not occur in accordance with any known or determined law, and the experience of the past is no guide as to what will probably happen in the future. The only result of including these elements in the estimate of useful life is therefore a shortening of useful life by an arbitrary amount, making it by so much less than normal wearing life. It follows, therefore, that the reserve for all those units which live out their normal life will be fully accumulated before the expiration of their period of usefulness, or in other words that the patrons during the earlier part of the useful life will pay not only their own particular depreciation charge but also the depreciation properly chargeable against the patrons during the remainder of the useful life.

On the other hand, if we consider those cases in which retirement through obsolescence, inadequacy, changes in the art, or public requirements actually occurs, it follows that, since the average useful life is the weighted mean between those cases in which the property does and does not live out its normal wearing life, the actual cases of retirement through obsolescence, inadequacy, changes in the art, or public requirements must occur prior to the termination of the estimated useful life and that therefore, working on the unit rule, the accumulated reserve for each unit will be inadequate and the deficit will fall upon the patrons of the particular year in which the retirement occurs, since this deficit is to be charged to operating expense. Practically, however, since rates cannot be adjusted to take care of this deficit, the burden will fall upon the security holders and result in a reduction or elimination of returns for the year in question.

The committee submits that the only practical methods of providing for these uncertain losses of value are by the accumulation of a separate reserve, by amortization after they occur, or by a combination of the two.

SHALL DEPRECIATION RESERVES BE ON UNIT OR GROUP BASIS?

If the depreciation reserves are to be set up on a unit basis under the system recommended by the depreciation section, the amount of accounting involved in the case of the larger properties will be enormous; but in addition to this, even if the estimated useful life is made equal to the normal wearing life, without regard to retirement through obsolescence, inadequacy, changes in the art, or public requirements, the system will result in marked inequality of charge for depreciation purposes against the users in successive years, and in particular against the collective group of patrons during the first life cycle as compared with the collective group during the second life cycle.

Assume, for example, that this rule is in force and consider the charges against the patrons during the first life cycle of a group of new units. These patrons will be charged, first, full replacement cost on those units which live out or overlive their estimated life; second, full replacement cost on all those units that fail to live out their estimated useful life; third, full annual depreciation charges on those units which replace the units which fail to live out their estimated useful life. Patrons of the second life cycle, on the other hand, are relieved of any payments for depreciation during the remaining life of all those units of the group which exceed the average estimated useful life. In other words, the patrons during the first life cycle pay for more equipment than they wear out, while those during the second life cycle have the use of equipment without charge for its wear.

As a matter of fact, rates cannot be adjusted upward and downward from year to year in order to take care of these fluctuations in the depreciation appropriation, and the variation in the burden must be met by the security holders.

The accounting would have been simplified, exactly the same amount of money collected, and the charge equitably distributed if the reserve had been accumulated for the group and not for the individual units.

Another injustice to the patrons of the first life cycle from the adoption of the unit rule also follows in the case of all existing companies which have not already accumulated a depreciation reserve upon this basis. In other words, the general effect of the adoption of the regulation, at least in all properties where the number of units is sufficient so that annual replacements are approximately equalized, will be to force the shipping public to refund to the investors approximately one-half of the service value during the first life cycle after the adoption of the rule. The committee submits that, even if such refund is desirable, the present economic situation does not justify the loading of this burden upon the patrons of the railroads at the present time.

The difficulties growing out of the unit system of depreciation are all due to the fact that the depreciation section has attempted to determine useful life on an average basis, apply the resulting figures to individual units, and charge the deficit in the case of any unit which does not live out the average life to the unfortunate user or security holder at the moment of its retirement. It is obvious that such a system is economically unsound.

It is submitted that if the estimate of useful life is to be based on the average life of a large group or field of units, then the charges against operation for the establishment of a depreciation reserve or reserves for those units must be set up for the same group or field; and, further, that the overpayment on long-lived units (resulting in the completion of their reserve before the termination of their useful life) shall be used to meet the deficit due to underpayments on short-lived units which failed to live out their estimated useful life. The result of such use, of course, is a deficit in the reserve of the long-lived units which is properly charged against the patrons who get the benefit of these units during the remaining life years. It is certainly more equitable to charge this inevitable deficit against those who are given the use of the property than to charge it against those who happen to be the users in the year of retirement.

But if this position is adopted the reserve is practically on a group basis, and unit accounts become unnecessary.

All forms of dealing with theoretical depreciation demand for their application a predetermination of service life, and this is impossible for any particular piece of apparatus or for the collective apparatus of any particular company. Even those estimates of average life which are based upon a nationwide experience are, in view of the constantly increasing service demand, of doubtful value; but even if such average figures were accurate and dependable they could not equitably be applied to any particular company. Average service life estimates can only be equitably used when replacement costs are chargeable to a general replacement account. Vital statistics are accurate and dependable, but they are not a safe basis for self-insurance by the individual.

The method recommended for the handling of depreciation upon group properties differs, as noted above, only in the method of determining the ratio of salvage value to cost or ledger value, but the impossibility of isolating the units retired from time to time results in a second difference in that it will be impossible to charge into operating expenses of the year of retirement any deficit in the reserve, since there will be no indicated or designated portion of the reserve applicable to the property retired. This method, therefore, will not result in the inequality of charge between patrons in the first and subsequent life cycles, and will not accumulate a reserve in excess of current needs in the case of older properties where replacements costs have become practically uniform from year to year. In the case of new properties, however, or in the case of extensions of existing properties of sufficient importance to justify their recognition as a separate depreciation accounting group, the comments herein made as to accumulation of an unnecessary reserve still hold.

IS RESERVE FOR REPLACEMENT OR LIQUIDATION?

A depreciation reserve can serve but one or the other of two purposes. The first is the insurance of necessary replacement of property; the second is liquidation of the capital invested. Since, however, the investor in a major railroad business does not anticipate at any time an ultimate liquidation, he is not interested in and does not demand the accumulation of a liquidation reserve. Moreover, the public is not interested in the accumulation of a liquidation reserve and, in so far as it understands the fact that this reserve must be accumulated at its expense, does not demand (and in fact opposes) its accumulation. Regulatory bodies therefore should deal with a depreciation reserve only as a means of replacement.

The unit plan operated under the rules proposed will build a liquidation as well as a renewal reserve for all companies, old or new. The group plan operated under the rules proposed will build a liquidation as well as a renewal reserve for new companies (assuming ratio of salvage to ledger value to be estimated in view of the lack of experience) and also in the case of new extensions of sufficient magnitude to be treated as a group. It accumulates only a replacement reserve in the case of companies sufficiently old or with property sufficiently diversified to have practically uniform annual replacement costs.

The committee believes, therefore, that as between the group and the unit methods the former should be adopted, but we go further and respectfully urge that the practical, businesslike way of dealing with depreciation in the case of companies where the investor does not look to an ultimate liquidation is to allow each year as operating expense a sum reasonably in excess of the replacement costs of that year until a sufficient reserve has been accumulated in a general depreciation account to serve as a balance wheel or reservoir out of which to take care of any year-to-year variations in replacement costs; and thereafter in the event of any abnormal replacement cost which cannot properly be handled out of the reserve reservoir to charge the excess to a suspense account and amortize it in subsequent years.

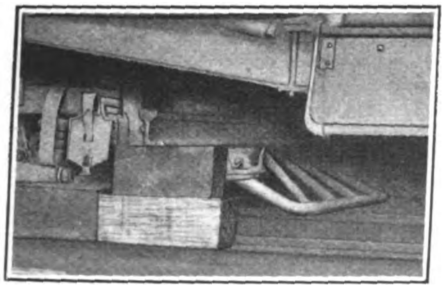
POSSIBLE TO DEVISE EQUITABLE SYSTEM

This association believes that it is entirely possible for the commission to set up under the interstate commerce commission act as amended a classification of depreciable electric railway property, fix tentative rates for each class, group the individual companies according to their needs, and devise a system of depreciation accounting that will equalize replacement burdens, prevent the accumulation of excessive reserves, and still leave the companies a reasonable and necessary economic freedom.

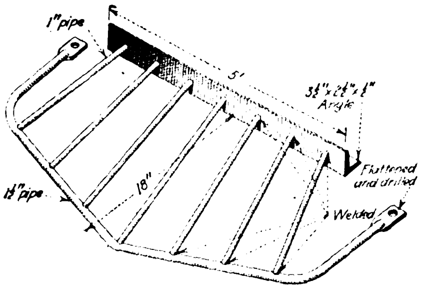
Maintenance of Equipment

Car Fender Made of Pieces of Steel Pipe

A SATISFACTORY though inexpensive type of car fender consisting mainly of short pieces of steel pipe is being used by the Chicago & Joliet Electric Railway on its interurban and suburban cars. For the outside edge of the fender a piece of 1½-in. pipe is used. A 3½-in. x 2½-in. x ½-in angle bar forms the back transverse member, which is attached to the truck frame, while seven pieces of 1-in. steel pipe, spaced equidistant, serve as supporting members between the angle and the outside or lower pipe. The ½-in. pipes, slanting upward, also act as a guard to prevent large objects from getting under the truck while the car is in motion.



This Fender Is Made of Pipe in the Shops of the Chicago & Joliet Electric Railway



Details of the Joliet Pipe Fender

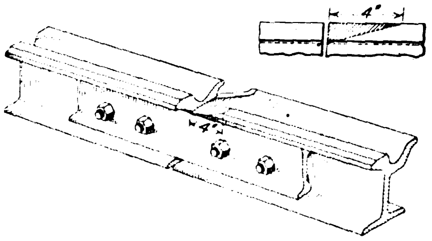
The piece of 1½-in. pipe is bent to the desired shape over a templet. The angle is cut and drilled to receive the bolts for anchoring it to the truck frame. With the pipe laid out flat on the floor the angle is placed on a support 6 in. higher and in the proper relation to the pipe to secure the correct angularity of the supporting members. The seven pieces of 1-in. pipe are cut to the exact lengths to fit. The two end supports are oxyacetylene welded into position first, after which the remaining five pipes are welded in position.

The outside member of the fender is attached to the same portion of the truck as the angle, the end of the pipe being flattened and bent into a position flush with the bottom face of the angle. A hole is drilled in this flattened portion to receive the bolt for fastening to the truck frame.

Fenders of this type have proved very satisfactory in the service in which they are used, and in no instance have the joints opened due to vibration of the truck. As mounted, the lower edge of the fender clears the track by about 7 in.

Rail Head Cut Back Before Welding Battered Joint

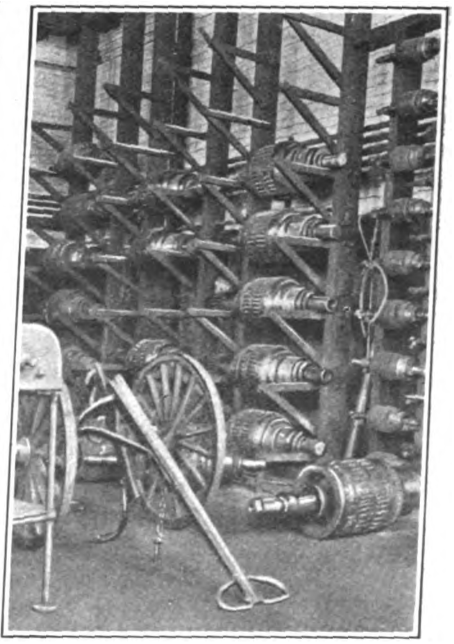
IT HAS been found by the Union Street Railway, New Bedford, in building up badly battered rail joints that more satisfactory results are obtained by cutting back the head of the rail on a diagonal before commencing to weld. This is done with an acetylene torch and takes only about ten minutes longer per joint than the old method. The cut is made on a slant from the top of the fish plate or from the bottom of the groove to the head of the rail at a point about 3½ or 4 in. back from the rail end. The joint is then built up by welding with hard steel and ground. The whole operation takes about one hour per joint and a job done in this way will last considerably longer than when the joint is built up simply by welding without cutting back the head of the rail for a new surface.



Head of Battered Rail Is Cut Back Before Building Up

Armature Life Prolonged by Careful Storage

SPARE armatures are stored in the shops of the Holyoke Street Railway in racks built up of metal bars as shown in the accompanying illustration. The supports are short arms extending from vertical posts and braced underneath by diagonal pieces. To prevent the armatures rolling off the end, the supports slope back slightly. A chain hoist traveling on an overhead trolley is used to lift the armatures and convey them to and from the racks.



These Simple Racks Provide a Convenient Place for Storing Armatures

Dipping and baking armatures is not favored by this railway. Insulating varnish has been found to be sufficient protection. In spite of the fact that winters are severe in Massachusetts and much snow usually falls, there have been few burned out armatures. The principal cause of failure is in the bearings. During December, 1923, and January, 1924, there was only one armature burned out on the sixty-odd cars operated on this railway.

The care exercised in handling armatures is thought to be an important element in prolonging their period of service.

Chattanooga Signal Record Still Improving

THE effect of careful maintenance on the forty-two Nachod signals in use on the single track in and about Chattanooga, on the lines of the Tennessee Electric Power Company, continues to show improvement, as revealed by the annual report of the signal department, covering the year 1923. This is to be compared with a report covering the years 1919-1922 in the Feb. 10, 1923, issue of ELECTRIC RAILWAY JOURNAL, page 254.

In the table below figures are given showing specific troubles found, with the number of cases of each. During 1923 these were reduced to seventy-one from eighty-six in 1922, while the total of all the signal operations was increased from 2,082,404 in 1922 to 2,124,680.

The operations per failure were 24,214 in 1922 and 29,928 in 1923, an increase of almost 23 per cent. A comparison of previous years shows that the record has been consistently and continuously improved from 11,336 operations per failure in 1919. The number of lamps out has been markedly reduced, due to regularly renewing them at stated periods, while contactor troubles almost completely disappeared.

COMPARATIVE RECORD OF SIGNAL TROUBLES FOUND IN CHATTANOOGA

	1922	1923
Line wires	3	2
Fuses blown	9	15
Lamps out	19	8
Relay trouble	11	13
Setting contactor	6	4
Restoring contactor	5	4
Bad grounds	3	6
Pole wiring	13	6
No trouble found	12	3
Miscellaneous	5	10
	86	71

	1922	1923
Total operations of all signals for year	2,082,404	2,124,680
Number of operations per failure	24,214	29,928
Average yearly operations of each block of signals	99,162	101,174
Average daily operations of each block of signals	272	276
Number of blocks in service	21	21

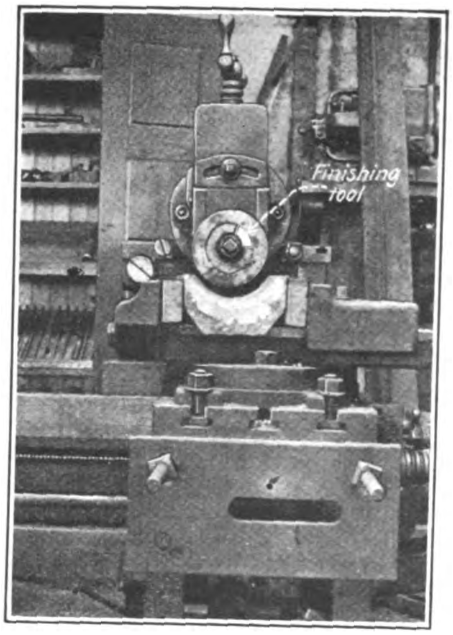
The department overhauled twenty-two old signals and relays, at the same time converting them into the latest model. The oil in which the relays are immersed was renewed in twenty-five of the signals. Three blocks of signals were converted into other types to conform to different operating conditions, and one of them was made to work in conjunction with a Cheatham switch. Twenty-seven overhead trolley contactors were taken down, painted and adjusted and 2½ miles of iron line wire replaced with No. 10 copper.

The signal department also installed one Cheatham switch and changed the location of two others of these switches.

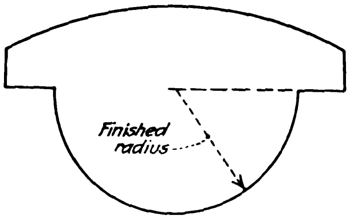
Finishing Journal Bearings on a Shaper

IT IS quite common practice among electric railways to fit journal and axle bearings to the particular shafts on which they are to operate. After babbitting, the insides are usually either turned or bored out to the required dimensions. As clearance is usually allowed at the side for the entrance of oil, the important fitting dimensions are the depths and the radius at the top.

The Philadelphia & Western Railway, Norristown, Pa., has found it convenient to machine journal and axle bearings in a shaper by employing a circular tool which is bolted to the tool post. The edges of this steel disk are beveled so as to provide a cutting face, and by use of different diameters for the disks any desirable variations in the finished bearings can be produced. In finishing, the bearing is clamped to the bed of the shaper and as the tool is moved back and forth the cuts can be regulated as desired. An allowance of approximately $\frac{1}{16}$ in. babbitt is made for machining purposes.



Cutting Babbitt from a Journal Bearing in a Shaper



Gage Used for Accurate Fit of Bearings

In order to provide for accurate gaging of the bearings during the machining operation a circular gage is provided which gages the inside radius from the split bearing face. An accompanying illustration shows the method of machining the bearings and type of gage used.

New Handles for Old Tools Save Money

THE maintenance of way department of the Springfield Street Railway, Springfield, Mass., has made a saving in the purchase of new tools by a program of replacing the handles in old ones. Among such tools as shovels, picks, hammers, axes, and the like, a broken handle is usually the cause of the tool being discarded.

To avoid throwing away good material the railway employs one man in the storeroom of the track department during bad weather to refit tools with new handles. The latter are purchased locally for such tools as picks and axes and are made in the carpenter shop of the railway for tools for which handles cannot readily be purchased.

Heavy Plow Tears Up Pavement Quickly

AN UNUSUAL method of removing old pavement from between the rails is used by the Boston & Worcester Street Railway. A small car has been constructed with a square framework of 20-in. steel I-beams. Inside of this frame is another frame, triangular in shape, and built of 15-in. I-beams. To the bottom of the triangular frame 75-lb. T-rails have been bolted upside down. These are pointed at the front end and bent downward three-quarters of an inch. Adjustment of height is made by blocks under the springs so that the pointed rail ends will clear the pavement or dig into it to any desired extent.

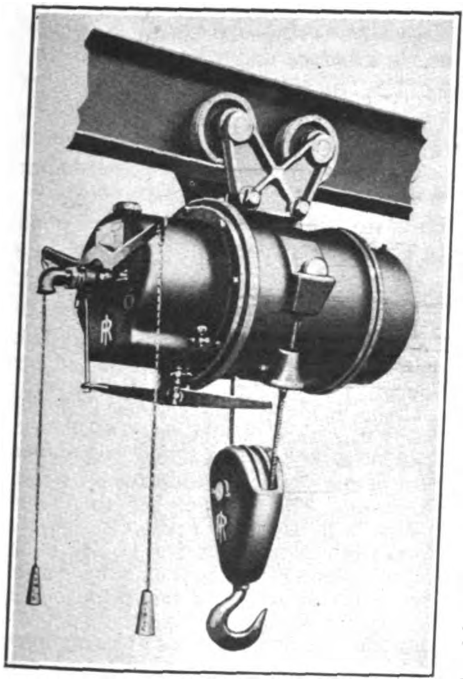
The triangular frame has been filled with 4½ tons of concrete, making the total weight of the pavement digger about 9 tons. It is pulled by a 1¼-in. steel cable 20 ft. in length and attached to the vortex of the triangle. Two 30-ton cars are used to pull the digger. On a recent job, pavement was removed by this apparatus in six hours that would have cost $1,800 to remove by hand.

New Equipment Available

Air Motor Hoists with New Features

FOUR heavier sizes of air motor hoists have now been added to the line supplied by the Ingersoll-Rand Company, New York. These hoists range in capacity from 500 to 10,000 lb.

Among the features incorporated in these hoists is a balanced three-cylinder air motor which operates in either direction. The throttle graduation is very fine and controls the hoist at any speed. A safety stop lever is provided which closes the throttle and stops the motor whenever the load is by chance raised to the top of the hoist.

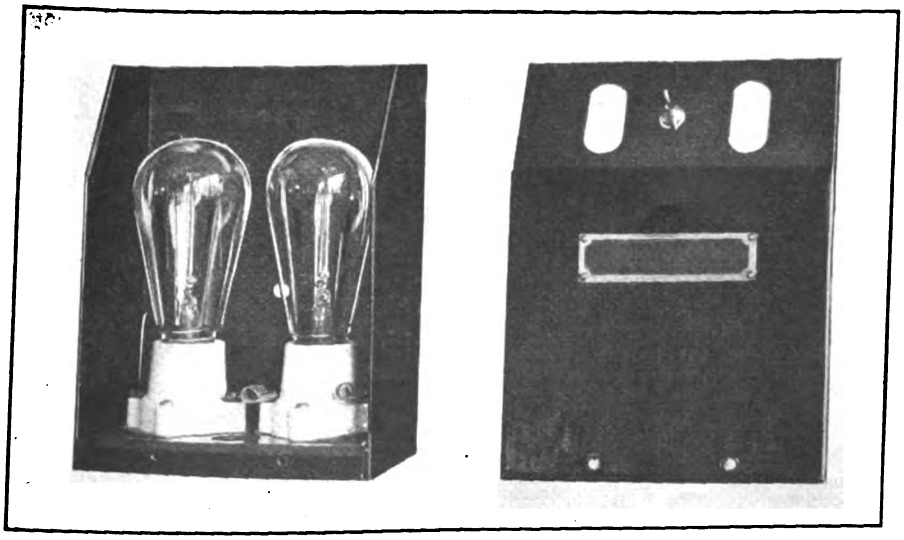

New Air Motor Hoist

The addition of an automatic brake is a new feature. This holds the load at any desired position regardless of air pressure. The brake consists of a disk attached to the motor shaft and a brake plunger with a friction base which is held in contact with the disk by a spring whenever the hoist is not operated. It is entirely automatic in its action.

Light Box Signals Traffic Officer as Well as Motorman

A NEW type of signal light box has been developed by the National Pneumatic Company, New York. An interesting feature of this box is the inclusion of two holes in the back of the box opposite the top of the two signal lamps. With the doors closed and the car ready to start light shines through these holes. The box is installed so that these come just above the window ledge at the front of the car, and traffic officers can thus see when lamps are lighted and are advised that the car is in readiness to move. They can thus signal traffic for prompt operations of cars.

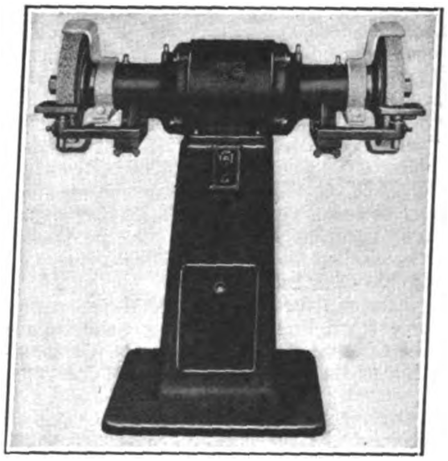
Another new feature of the signal box includes a dimmer for the front signal holes, so that during the night time some of the rays from the lamps can be shut off, but during the daytime the maximum illumination is obtained. This consists of a slide inside the cover with a wing nut attachment on the front. By loosening this slide can be changed so as to dim the illumination or give full illumination as desired.


Signal Light Box with New Features

Wide Swing Grinder

A NEW construction in grinding machines with the wheels spaced 37 in. apart is being marketed by the Hisey-Wolf Machine Company, Cincinnati, Ohio. This wide spacing permits grinding of large bulky castings and at the same time prevents interference where two workmen grind at the same time.

This machine is equipped with a 3-hp. motor and can be furnished for either alternating or direct current operation. The size wheels recommended are 14 in. in diameter and the machine is suitable for use in mounting wire brush wheels or buffing wheels. A special feature is the adjustable open end wheel guard, which can be readily removed if desired.


Wide Spaced Grinding Wheels Fitted with Open End Wheel Guards

A fully inclosed and combination wheel guard can be supplied to order. This guard is fitted with removable end covers and exhaust pipe connection, and, like the open type guard, is of dimensions and specifications as recommended by the American Engineering Standards Committee. It is adjustable to any angle and can be moved back as the grinding wheel wears. This full safety guard is interchangeable with standard open end guard. Four high-grade ball bearings are fitted to the spindle.

The grinding rests are adjustable and are held in position by clamping nuts and bolts with concealed heads. The spindle is of one-piece construction and made of high grade steel. The grinder has a base 22 in. x 25 in. and the motor has a no-load speed of 1,600 r.p.m.

The News of the Industry

Detailed Improvement Plan Submitted

Rerouting, Trackless Trolley and Gasoline Bus All Included in Commissioner Cann's Plan for Toledo

General rerouting of railway lines, establishment of a trackless trolley crosstown line, and the development of a double-deck gasoline bus "de luxe" service on Collingwood and Madison Avenues—the most exclusive residence and business thoroughfares in the city—are included in a plan which Street Railway Commissioner W. E. Cann laid before the City Council at Toledo. The entire plan will possibly come before the Council on March 3. The cost of the plan is estimated at $760,000, with $532,820 for the physical changes in the present system, $157,000 for overhead equipment and cars for the trackless trolley line, and $76,000 for the double-deck buses.

The matter of the trackless trolley crosstown line has already been before the Council for several weeks. Disposition of the issue has been delayed from week to week because it is feared it will be practically impossible to pass the necessary enabling measure without some concessions.

It is believed that in order to carry out the double-deck gasoline bus feature, which is an innovation, a separate corporation would have to be organized to operate the buses. A 10-cent fare would be charged on the buses and a ten-minute schedule maintained. It is not known what the attitude of the Community Traction Company would be toward this form of operation, but it has already frowned upon the use of buses on the crosstown line.

The commissioner told the members of the Council at a special meeting on Feb. 23 that he estimated the changes would increase operating expenses by $666,951 a year, while the revenue of the lines would be increased by $558,930 through the economy of the changes and additional service possible.

He intimated that the apparent loss of $108,021 would be easily absorbed through economies of one-man operation on various lines at all except rush hours.

Retaliatory Measures Resorted to by New York City Board

The Board of Estimate of New York, sitting in committee of the whole, adopted formally on Feb. 25 a policy of refusal to enter into contracts with the Brooklyn-Manhattan Transit Corporation for the operation of subways or any other form of transportation lines. A resolution to that effect was offered by Comptroller Craig as the result of a discussion of the withdrawal of surface car service across Williamsburg Bridge. Every member of the board voted for the proposal except Borough President Maurice E. Connolly of Queens, who said he saw no need of such action. A large delegation of Brooklyn residents criticised the present municipal operation of the bridge cars and asserted that because of the municipal 3-cent operation thousands of passengers were forced to pay an additional fare or walk.

The board laid over for further consideration the method of construction of the extension of the Fourteenth Street-Eastern subway. Two hundred men and women from the Ridgewood and East New York sections of Brooklyn urged immediate action, and the members of the latter delegation opposed the construction of an elevated structure. Borough President Connolly of Queens urged that the line should be built through Wyckoff Avenue instead of Cypress Avenue, which brought opposition from both delegations. The board decided to visit the sections affected with Arthur S. Tuttle, its chief engineer, before making a decision.

Transportation Puzzle Solved

Cincinnati Street Railway and Traction Company Submit Agreement—Seven and One-Half-Cent Fare Favored at the Meeting—Much Yet to Be Done to End Controversy

SUBSTITUTION of an entirely new traction contract for the present service-at-cost franchise, declared to be "beautiful in theory, but not workable as a practical proposition," appears to be likely to result from negotiations that terminated in the presentation to the Council committee on street railroads on Feb. 21 of a plan for the solution of the railway problem of Cincinnati, Ohio. The Cincinnati Traction and the Cincinnati Street Railway, the two parties to the controversy, insist that the agreement will achieve all that the city administration has sought in addition to improved service and lower fares. The agreement, signed by W. Kesley Schoepf and Walter A. Draper for the traction company and by Robert A. Taft and Samuel Assur for the street railway, was discussed in executive session by city officials, Councilmen and members of the Mayor's citizens' street railway committee following the public hearing in the Council chamber. The terms will also have to be approved by the directors and stockholders of the two companies, to whom they are to be submitted at the earliest moment.

The agreement was read to the members of the Council committee. It is predicated upon demands made by Mayor George P. Carrel and the City Council two years ago. In substance, these demands called for a scaling down in capitalization; a consolidation of the two companies involved, so that the city might deal with a single corporation, and a divorcement from the present street railroad organization of all activities that were not directly concerned in the actual operation of the railway.

It was announced that before the administration would commit itself as to the acceptability of the agreement between the two companies there must be a definite understanding as to what is to become of the other provisions of the franchise, since the conditions imposed by the agreement were considered to clarify only one phase of that contract. Accordingly it was suggested that a special committee be named by Council, to be composed of the Mayor's cabinet, including the service and the safety directors, vice-mayor, street railroad director, city solicitor and members of the Council committee on street railroads. The members of this committee will listen to further proposals from the railway company, which is to become the operating company under the terms of the agreement, as to the disposition of the other questions affecting the present service-at-cost franchise.

Some of the questions to be determined are: What shall be the rate of fare? Is the cost of operation to be the determining factor, as provided for under the existing contract, or shall that contract be discarded entirely and a new franchise substituted that will contain a definite fare to be charged until 1932, when, under the original franchise granted under the Rogers law, there is to be a revision?

With regard to the fare feature some of those at the conference favored a straight 7½-cent fare until 1932, provided other terms of the proposed amended franchise tax were satisfactory. A further question to be determined is whether or not the city, in the interest of the car rider, shall forego the franchise tax, which, under the existing contract, is to be paid when earned, and if so, is the operating company to assume the obligation of maintaining the streets between rails? Also, what return upon the capital is the company to be permitted to earn in the interest of low fares and improved service?

These are some of the details that will have to be worked out before it can be stated finally that the entire problem definitely has been adjusted to the satisfaction of all parties at interest. It was predicted that it will be at least three or four months before an end is reached in the five-year controversy. The report recites that the Cincinnati Street Railway agrees to purchase all the interests of the Cincinnati Traction Company in the system, and that thereby two of the demands of the Mayor and the Council will have been met.

As to reduction in capitalization, it provides that the capital shall be reduced by approximately $10,000,000, exclusive of any reduction in the capital of the Cincinnati & Hamilton Traction Company, known as the Millcreek Valley line. The present capital of that corporation is $2,200,000, divided equally into common and preferred stock.

While the agreement makes no direct reference to the fact, the new operating company as soon as possible also will purchase the Millcreek Valley line outright from present stockholders. Whatever price is paid for that property will be additional capital.

The basis of the purchase price of the Cincinnati Traction Company interests and of the leasehold of the Millcreek Valley line from the Ohio Traction Company is $4,250,000 in stock of the Cincinnati Street Railway and the assumption by the latter company of $2,817,000 of outstanding obligations, together with $1,651,000 car trust certificates. In addition the Cincinnati Street Railway will assign its perpetual leasehold in the Chester Park property. That property comprises approximately twenty-five acres, now devoted to amusement purposes. The lease contains a privilege of purchase clause for $100,000.

The Traction Building and the Cincinnati Car Company also will be retained by the Ohio Traction Company. In that connection a new company will be organized to take over the park property, car building plant and the Traction Building. W. Kesley Schoepf, president of the Cincinnati Traction Company, will head this new organization.

If the terms of the joint agreement are ratified ultimately the total outstanding permanent capital of the new operating company would be $22,761,950 exclusive of any stock that may be issued for the purchase of the Millcreek Valley Line. The total capitalization will include, however, the $2,817,000 outstanding obligations to be assumed and which are being liquidated and also the $1,631,000 car trust certificates which are being paid off through charges to depreciation.

It was stated that neither of these items represents permanent capital, the total of which, even with the purchase of the Millcreek Valley Line, will approximate not more than $24,000,000. If this last figure represents the total permanent capitalization, it will be $1,000,000 less than suggested as the maximum by the Mayor's citizens' street railroad committee. The joint report submitted by representatives of the two companies indicates that with the $10,000,000 reduction of the existing capital there will be an annual saving to the car rider of approximately $546,000, which in terms of fares, would represent a trifle more than one-half cent per passenger. This will make possible a reduction in fares as soon as the new arrangements have been put into effect.

Co-operation on the part of the city of Cincinnati and of Norwood is sought by foregoing the franchise tax and also the percentage tax on gross earning demanded by the two municipalities respectively under existing contracts. If that is done, the capital reduced as proposed and the other suggested economies are carried out, a 7½-cent fare is possible. The company now pays approximately $500,000 property tax annually for county, city and school purposes, in addition to other taxes which aggregate $800,000 a year without considering any municipal franchise tax.

Detroit's Corporation Council Removed

The appointment of C. E. Wilcox to handle the claims of the Department of Street Railways at Detroit, to which reference is made elsewhere in this issue, was opposed by Corporation Counsel Richard I. Lawson, who maintained that the Corporation Counsel's office was equipped to care for the legal matters that might arise in connection with the street railways.

Mr. Lawson was appointed Corporation Counsel by Mayor Frank E. Doremus. He was dismissed by Joseph A. Martin, acting Mayor during the absence of Mayor Doremus, who is ill. Mr. Martin's drastic action followed Mr. Lawson's refusal to recede from his position in opposition to the appointment of Mr. Wilcox as the executive head of the claims division of Department of Street Railways. Mr. Lawson contended that under the charter he alone as Corporation Counsel is vested with the authority to name counsel for any department of the municipal government.

Acting Mayor Martin stated that Mr. Lawson's refusal to approve the action of the Street Railway Commission in appointing Mr. Wilcox made Mr. Lawson's dismissal necessary in order to sustain the actions of the Street Railway Commission and to protect the people's interest in the municipally-owned street railway.

Proposal Made to Reestablish Galva-Kewanee Line

B. F. Lyons, Beloit, Wis., has presented to Kewanee's City Council a proposition to take over all the local public utilities, including the railway system and the interurban line between Galva and Kewanee, now inactive.

It is Mr. Lyons' plan to extend the local railway to the north end of town, which was not served by the Galva & Kewanee system, improve the interurban service, give the city a modern electric light plant and reduce gas rates 25 per cent.

Mr. Lyons emphasized the need of a railway between Galva & Kewanee. He pointed out that during 1922, 132,077 people rode on the interurban between the two cities. In the same year, 739,353 passengers were carried on the city line.

Paper Says Buses Are Fair Weather Agency

The Grand Rapids *Herald* of Feb. 23 says that when the blizzard of Feb. 19 blocked the highways of western Michigan bus lines generally called in their cars and hung out the "Roads closed" sign. The paper says that on the other hand their competitors, the interurbans and the steam railroads, put on special crews of workmen and recommissioned their snowplows. Thus the job of opening the highways was left by the bus lines for the county and state to do with the public's tax money, while the job of keeping the railroads and electric lines going was accomplished by the transportation corporations out of their own treasuries. The paper sees in this evidence of a remarkable difference in standards, methods and expenditures of two competing transportation services. In commenting on the situation the paper said:

> Throughout the storm last Tuesday the rail lines, including the street railway here in Grand Rapids, made every effort to keep up service, and by noon Wednesday practically all schedules were restored to normal. This storm service was not profitable. It costs Michigan railroads and electric lines thousands of dollars each year. But it is a fundamental doctrine of rail transportation that service must be maintained. On the other hand, snow removal and storm service cost the bus lines little or nothing. When the roads are opened it is county and state plows, operated at public expense, which break through the drifts. And as soon as the job is done the buses are back in service.
>
> The same is true of the jitney bus as a means of local transportation. It is fair weather transportation, punctually available when transportation is least necessary. Street cars, on the other hand, are an all-weather transportation, functioning particularly when needed most.
>
> This telling point exemplifying the essential difference between present highway and railway transportation is not necessarily an argument in favor of less consideration for buses. But it is either an argument for more consideration for interurbans and other rail lines or an argument for fixing greater responsibilities on bus lines. Society's problem in terms of transportation is to equalize the responsibilities and burdens of these competing elements.

Legislature Will Consider Railway in York, Ont.

Negotiations are in progress looking toward giving full power to the York Township to operate railway service in any or all parts of the municipality. It was arranged at a recent meeting with Toronto transportation officials that the township should submit a definite proposition to the commission, on which future negotiations would be based. It is believed that the township will ask the commission to build and operate the line and provide the cars. No matter what the Legislature at its session will decide, it is practically certain that the township will take over and rehabilitate the section of the old Toronto Suburban between the city limits and the Humber River, a distance of approximately 1 mile. This will cost the township $20,000, and another $20,000 to rehabilitate it. The township scheme includes the construction of the Oakwood line, of about 4½ or 5 miles of double track, at an approximate cost of $1,250,000. The people of the district have already indorsed the project, but the necessary money by-law has not been submitted. The commission stated that all negotiations were subject to approval of Council.

Goodyear Did Not Oppose Akron Railway

The news report from our Akron correspondent published on page 226 of the Feb. 9 issue stated, in connection with the circulation of a petition for signatures favoring the franchise sponsored by the railway company, that car men had been refused entrance into the plant of the Goodyear Tire & Rubber Company, and, furthermore, that employees had been warned against signing the petition on penalty of dismissal.

The JOURNAL has been satisfied that this statement was an injustice to the Goodyear Tire & Rubber Company.

The circulation of the petition in question in the Goodyear plant was refused, but this is merely a standing rule of the company against all petitions, and similar refusal was made on a petition against an increase of the 5-cent fare. As to the threat of dismissal, Goodyear officials claim that no such instructions were issued. It may be that some discussion among the men gave rise to the spread of this report, but it was not a company measure. The Goodyear people also claim not to have been identified in any way with what has been felt was a generel movement of the tire people to back the motorization of Akron.

During the controversy one of the Akron newspapers printed a statement to the effect that Goodyear Assembly workers had backed the Mayor in his fight for a 5-cent fare. A company official writes that the Goodyear Assembly is an institution of factory laborers which acts independently of the policies of the Goodyear company in its opinions, and it does not in any way represent or reflect the attitude of the company. As a matter of fact, it is explained that the Assembly is not unanimous in its stand, inasmuch as one of its members, also a member of the Akron City Council, introduced an ordinance advocating a 6-cent fare for the railway.

It should be stated in passing that the Goodyear Tire & Rubber Company is a member of the American Electric Railway Association.

Fighting the Season's Blizzard

The baby blizzard which swept the Atlantic Coast on Feb. 19 blanketed New York City in several inches of snow, pressing into service thousands of employees with their plows, tractors and other snow-fighting apparatus. Traffic was delayed and, with the after-business and after-theater rush, subways were jammed to capacity. In order to inconvenience the daily toilers as little as possible the New York Transit Commission offered a suggestion that employers send home their help early so that the traveling might be a little more evenly distributed. In Rochester the New York State Railways called out all the available men and equipment. By hard fighting both the city and the interurban lines were kept open throughout the storm, although traffic was delayed generally. The East Avenue bus lines kept running, but on delayed schedules. Several interurban bus lines radiating from Rochester were tied up by country drifts on Feb. 20. In Pittsburgh, when the ice and sleet began to cripple seriously the transportation, several hundred employees of the Pittsburgh Railways were out clearing the car tracks instead of being decorated at their safety rally, which had to be postponed indefinitely.

$24,500,000 Program

Chairman of Boston Trustees Indicates Need of Extension of Term of Public Control

A program of improvements on the Boston Elevated Railway to cost $24,500,000 has been prepared by the trustees of the company. It was outlined by Chairman James F. Jackson on Feb. 28 before the committee on street railways of the Massachusetts Legislature in connection with a hearing on a bill to authorize the company to issue bonds. The program is as follows:

1—Completion of Everett Shops.	$4,500,000
2—Modernizing surface carhouses, repair units and track layouts	4,000,000
3—Completion of South Boston boilers, cable and switching requirements at South Boston, underground conduit and substation additions	3,000,000
4—(a) 25 steel elevated cars needed for increased traffic. (b) 53 Cambridge subway cars for Dorchester extension. (c) Replacing 400 inefficient surface cars 22 years old. (d) Replacing 100 wooden elevated cars 22 years old........	10,000,000
5—Storage for 60 elevated cars at Everett, lengthening elevated station platforms for eight-car trains; miscellaneous machinery, buses, garages, Everett and Linden Street terminals, track betterments over a period of three years	3,000,000
Total	$24,500,000

Chairman Jackson in addressing the legislative committee reviewed the affairs of the company at length, repeating as was necessary in a statement of the kind many facts about operation noted from time to time in the ELECTRIC RAILWAY JOURNAL. He said that five of the ten years fixed as the period for the public control of the railway by the state ended June 30, 1923, and that it would seem to go without saying that the commonwealth must desire a genuine test of the service-at-cost furnished by the State to its citizens. As he sees it the outstanding need of the railway is additional capital for changing and extending the existing subways and permanent structures and for building additional subways and structures.

Mr. Jackson says that while the policy of gradually replacing obsolete and worn-out cars with modern equipment can be continued through the use of operating revenue, the time has come when additional cars must be provided, the cost of which cannot be met from operating revenue but must be met from capital. He also says a second unit must be built at the Everett shops.

Mr. Jackson says:

> Capital for all these purposes is ordinarily obtained by the issue of corporation stock or bonds. Under the settled policy of this Commonwealth no stock can be issued at less than par value, and no bonds can be issued in excess of outstanding stock. Until, therefore, the stock of the Boston Elevated sells at par and the margin between outstanding stock and bonds has been increased the door is closed to the issue of corporate securities.
>
> The cold, calculating money market is extremely sensitive and independent in its movements. It all seems to come to this, that unless there be legislation extending the period of public control any new issue of stock at par will be impossible. And without such preliminary issue of stock there can be no issue of bonds.

Mr. Jackson is opposed to any special legislation changing in this case the State policies with reference to issue of stocks or bonds. Moreover, he does not think any such change would solve the problem. In conclusion he says:

> It would seem consistent with sound public policy that there should be legislation which would enable our car-riders to secure necessary capital upon rates that would reflect the advantage of a public over a private service.
>
> Apparently, look in whatever direction one may, the all-important change in the present situation seems to be the making more definite in one way or another what is to be the tenure of public control, whether or not it is to extend beyond 1928.

Expert Answers Transit Queries.—How soon can new subways be built and to what extent will they relieve present conditions in New York City, N. Y., are questions which James Blaine Walker, secretary of the Transit Commission, is answering in a series of articles in the New York *Evening Post.* Article I, under date of Feb. 27, gave the general outline of the transit problem, dwelling on the terrific increase in travel in the past twenty-odd years and the resultant need of not two subways but of three or four subways. In the next article Mr. Walker will give the history of the subways with some interesting news angles.

Posters Give Information.—Posters which really carry a message and at the same time have sufficient coloring and effective layout to attract the eye were used during February in the cars of the Philadelphia Rapid Transit Company, Philadelphia, Pa. One poster advertised a new and improved trolley route guide, route map and directory for sale by conductors and "L" cashiers at 10 cents. Another told that the longest suspension bridge in the world could be seen on special trolley routes of the Elevated and urged patrons to "watch it grow." Still another suggested seeing the waterfront, manufacturing district and Roosevelt Boulevard—16 miles for 19 cents by bus and railway.

Engineer Should Study Subway Plan.—According to a tentative report submitted to the City Council of Pittsburgh, Pa., recently by a special committee of five appointed several weeks ago, traffic problems and other matters which enter into the plan for a $6,000,000 downtown subway loop should be carefully studied by a qualified engineer, with a selected advisory committee of citizens. The committee is of the opinion that experimental investigations into the further control of the vehicular and railway traffic within the triangle district is necessary. It further suggests that these experiments might be put into operation during certain hours of the day and not in effect at other times. The committee said that no definite conclusions have been reached because since 1917 four plans for subway facilities have been advocated.

Financial and Corporate

$1,800,000 Net for P. R. T.

$1,000,000 Loss in Revenue in Philadelphia Attributed Largely to Frankford "L"—Consolidation Suggested

The year 1923 again shows the 6 per cent dividend on the Philadelphia Rapid Transit Company's $30,000,000 capital stock to have been earned. It is explained that while passenger revenue increased $2,490,597, the greatly increased use of free transfers, through the operation of the Frankford "L," reduced the average fare from 4.91 cents to 4.81 cents, the equivalent of one mill on each of 918,000,000 passengers. This represented a loss in revenue through reduction in fare of almost $1,000,000.

Operating expenses and taxes increased $2,182,143. The principal contributing factors here were increased car service given, increased cost of purchased power and duplication of operating costs due to the impossibility of making effective the reduced surface car service which was contemplated to offset the riding diverted to the Frankford "L."

The stockholders approved the payment of a 1922 and 1923 co-operative wage dividend to employees not to exceed 10 per cent of the annual wages. Since this is payable only after the stockholders' 6 per cent has been earned and paid, the company explains that P. R. T. becomes in effect a preferred stock, underwritten by the employees. Mitten Management, with the stockholders' assent, proposes to continue the 10 per cent co-operative wage dividend during 1924.

An unexpected wage increase of 3½ cents an hour to which the men were entitled from June 1 under the three-city average scale made it impossible to earn the full 10 per cent co-operative wage dividend for 1923, after payment of fixed charges and the stockholders' 6 per cent dividend. The employees, believing that ownership of the workshop was more important than receiving 3½ cents an hour more in the pay envelope, signed over this wage increase—amounting to $600,000 for the year—to the co-operative wage dividend fund. This wage investment, together with the wage dividend actually earned, which amounted to $1,200,000, made up a total of $1,800,000 added to the fund during 1923. This leaves the fund short by $50,000 of the full 10 per cent for 1923, but men and management have jointly undertaken to make up this amount by added effort during 1924.

The company points out that the $2,500,000 real estate mortgage loan, secured by car terminals and guaranteed by P. R. T., provides $1,500,000 for the new southern car terminal, after retiring outstanding liens. Reference is also made by the company to the plan to increase P. R. T. indebtedness from $15,000,000 to $25,000,000, to cover $3,500,000 of two-year 6 per cent notes, and to provide $6,500,000 for future financing. Stockholders will be asked to approve plans for equipment trust certificates which may later be issued in the acquisition of new motor buses.

PHILADELPHIA RAPID TRANSIT COMPANY INCOME ACCOUNT FOR YEARS ENDED DEC. 31, 1923 AND 1922

	1923	1922
Gross passenger earnings	$44,249,360	$41,758,764
Other operating revenue	681,130	770,779
Railway operating revenue	$44,930,491	$42,529,543
Way and structures, equipment and power—maintenance, renewals and depreciation	8,560,400	8,560,400
Power operation	4,416,307	3,475,307
Conducting transportation	14,003,087	13,383,432
General	4,060,159	3,548,378
Taxes, including paving tax	2,695,708	2,586,000
	$33,735,661	$31,553,517
Operating income	11,194,830	10,976,026
Non-operating income	621,539	706,429
	11,816,370	11,682,455
Interest	1,161,637	1,020,090
Rentals	8,674,732	8,683,087
Sinking fund—City contract	180,000	150,000
	$10,016,369	$9,853,177
Net income	$1,800,000	$1,829,278

The initial motor bus installation was made in September, 1923, when the Roosevelt Boulevard line connecting Frankford and the North Philadelphia section was placed in operation. Plans are under way for the establishment during 1924 of additional auxiliary bus routes covering 40 miles and requiring about 150 buses.

An experimental installation of the trackless trolley was made on Oregon Avenue, the southernmost crosstown street, to serve the shipping industries on the Delaware River. At present this section does not offer sufficient traffic to justify the large investment necessary in surface tracks.

Expenditures for improvements and additions during 1923 are shown in the accompanying table:

520 passengers and 56 utility cars	$6,616,703
Track extensions and track construction in co-operation with city paving	646,140
Motor bus and trackless trolley development	508,420
New substation, carhouse, shop and other equipment	536,302
Final repayment of U. S. Government wartime advances	1,381,759
	$9,689,324

President Dunbar says that the consummation of the plan looking to the simplification of the present complicated corporate structure of the P. R. T. leasehold system, now under consideration, would greatly strengthen P. R. T. by giving it the added financial power necessary to greater participation in city-company transit development. This plan contemplates a consolidated ownership in one corporation, providing for an exchange of the various securities of the present owning and leasing companies for such bonds and stocks in the new corporation as will preserve existing relative priorities.

PASSENGER STATISTICS OF PHILADELPHIA RAPID TRANSIT COMPANY

	Passengers Carried 1923	Passengers Carried 1922	Average Rate per Passenger 1923	Average Rate per Passenger 1922	Passenger Revenue 1923	Passenger Revenue 1922
January	74,857,899	68,147,370	4.84c	4.94c	$3,625,767.94	$3,363,925.75
February	68,570,408	62,513,337	4.82	4.93	3,305,182.54	3,082,552.87
March	79,422,257	71,625,943	4.82	4.92	3,827,671.64	3,525,522.04
April	76,730,494	71,430,998	4.81	4.92	3,694,068.56	3,514,679.44
May	82,591,742	75,952,200	4.81	4.91	3,973,888.38	3,727,018.41
June	77,264,587	70,675,234	4.82	4.91	3,723,608.11	3,467,919.88
July	72,719,051	67,563,520	4.80	4.89	3,493,820.93	3,305,598.30
August	71,609,710	66,713,224	4.80	4.89	3,435,641.53	3,261,881.54
September	73,237,080	69,350,179	4.80	4.90	3,515,750.30	3,396,512.88
October	81,258,998	74,757,191	4.80	4.89	3,898,959.12	3,658,031.40
November	78,555,394	74,246,140	4.80	4.89	3,771,562.44	3,634,190.44
December	80,969,615	75,908,176	4.81	4.91	3,983,439.27	3,820,930.51
Total	917,787,235	848,883,512	4.81c	4.91c	$44,249,360.76	$41,758,763.46

Boston Elevated Bonds Returned to the Legal List

Boston Elevated Railway bonds are again on the official list of securities in which the savings banks of Massachusetts may invest. The Massachusetts Department of Public Utilities has certified to the Bank Commissioner that the Elevated has earned and paid the required dividends for five successive years, which makes its bonds legal investment for the banks. The company dropped off the list when it failed to earn and pay the dividends, and the question has been raised whether the help which the company received from the various communities during its period of public trusteeship can be counted toward qualifying its bond issues for bank investment. This question was submitted to the Attorney-General, who has handed down an opinion in the company's favor. On the strength of this opinion the bonds have been certified to the Bank Commissioner.

Birmingham and Tidewater Railways to Be Sold on March 24

The date of the sale of the property of the Birmingham Railway, Light & Power Company, Birmingham, Ala., at public auction has been changed from March 15 to March 24. On this same date the Birmingham Tidewater Railway property will also be offered at auction at a minimum price of $500 000. The Tidewater company is under the same control and management as the Birmingham Railway, Light & Power Company. Both companies have been in the hands of receivers for some time.

The minimum sale price of the Birmingham Railway, Light & Power Company's property is set at $20,000,000 by the court, which includes all liabilities. All claims against the receivers of the company must be filed by March 7, according to the court order. Bids on the Birmingham Railway, Light & Power Company's property will be received up until noon on March 24. Bids on the Birmingham Tidewater Railway property will be received up until 12:30 o'clock on March 24.

Warren Street Railway to Be Sold

Application was made to the Pennsylvania Public Service Commission recently for permission to transfer the stock of the Warren Street Railway, Warren, Pa., to the Penn Public Service Corporation. The transfer includes the interurban lines to Jamestown, N. Y., and Sheffield and also the light and power franchises he'd by the Warren corporation.

The Warren system was founded in 1892 with D. H. Siggins as head of the enterprise. He built the lines to Sheffield and Jamestown. Later the active management was turned over to Hugh A. Siggins, who added the power and lighting facilities.

Hearings on Abandonment and Rates Combined in Ohio

The application of the Cleveland & Eastern Traction Company for permission to abandon its lines running between Cleveland and Chardon and between Warnerdale Junction and Middlefield, Ohio, on the grounds that the lines have been operating at a loss and can never be operated at a profit, was heard by the Ohio Public Utilities Commission on Feb. 15.

Coupled with the abandonment proceedings was the hearing on the application made by the company for an increase in fares from 3 cents a mile to 3.34 cents a mile, average, from a point 8 miles out of Cleveland to the terminals, Chardon and Middlefield. This would raise the cost of a ticket to the former point from 75 cents to 90 and to the latter from 95 cents to $1.20.

No decision was rendered on this application, while the hearing of the abandonment proceedings was continued until March 19 to enable the protesting parties to work up their case on the basis of the presentations made by the railway.

Both Robert D. Beatty, secretary and general manager of the company, and Charles Currie, Cleveland, ascribed the gradual decline of the interurban to three factors, in all of which the advent and maintenance of good roads is a factor:

1—Widespread use of the privately owned passenger automobile.
2—Growth of bus lines.
3—Increasing use of motor trucks for hauling milk, farm produce and freight.

Mr. Beatty testified that the red ink figures first appeared in 1922, when the opposition came strongest, while Mr. Currie testified that a survey made by him had showed a decrease in freight business from 1920 to 1923, a situation in which, he said, he was unable to find any indication that this branch of the business would ever become profitable.

Investors Service Reviews Utilities

The third survey of the utility field by Moody's Investors Service, dated Feb. 28, chronicles another year of genuine progress and prosperity. The outstanding developments of the electric railways, electric light and power companies, telephone and telegraph companies, gas companies and water companies are reviewed. With respect to the electric railways, Moody's says that in endeavoring to appraise and evaluate the many factors which enter the conviction arises that the final conclusions must wait upon further developments. Without going so far as to predict an era of prosperity for the electric railways, Moody's says that one can readily find much ground for encouragement with respect to them.

Better Report in Toledo in January

Operations of the Community Traction Company, Toledo, in December provided $5,041 plus $165 bank interest to be added to the fare stabilizing fund. Gross revenue was $359,859, an increase of $26,467 over the same month a year ago. Increased taxes, wages, interest charges and depreciation and maintenance allowances, however, cut down the net.

Through the sinking fund an additional $120,000 of 6 per cent bonds of the Community Traction Company has been purchased and retired and a corresponding par value of common stock issued to the city. This makes the city holdings now $596,000 of common stock. On this $2,980 a month in revenue is refunded to the sinking fund. Actual operating expenses for the month were $268,760. This is equivalent to 72.86 per cent of gross revenue. Revenue passengers numbered 5,535,810, an average of 178,574 a day compared with 176,784 in December.

Bus feeder lines continued to be operated at a loss.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

Net Income Falls Off.—For the six months period ended Jan. 31, 1924, the Brooklyn City Railroad, Brooklyn, N. Y., reports a passenger revenue of $6,854,569, against $6,815,593 for the same period ended a year ago. The net corporate income showed a falling off from $1,180,409 for the six months ended Jan. 31, 1923, to $1,143,871 for the six months ended Jan. 31 of the current year.

Deficit for Six Months.—For the six months period ended Dec. 31, 1923, the Interborough Rapid Transit Company, New York, N. Y., reported a deficit of $442,645. The total revenue for the six months period was $28,082,921. Income available for all purposes was $7,247,292.

Suggests Purchase Consideration.—The Colorado Springs & Interurban Railway, Colorado Springs, Col., recently announced to the City Council that owing to operating losses caused by the increase in automobile traffic it will not apply for a renewal of its franchise. The company has suggested that the city take up the question of buying the company's property, valued approximately at $3,500,000. The railway is owned largely by the estate of Winfield Scott Stratton, one of the city's chief benefactors. The company has not paid bond interest for two years and no dividends have been paid since 1912 on the $500,000 of preferred stock outstanding.

Another Payment on Account of Municipal Railway Purchase.—The remaining debt of the city of Seattle on account of its purchase of the local railway lines, for which $15,000,000 in bonds was issued to the owners of the system, was reduced to $12,501,000 recently when City Treasurer Terry wired to the city's fiscal agency in New York $1,337,187 to meet bond interest and principal payments due on March 1. The payment included $833,000 principal and $333,350 interest on the railway purchase bonds, also $26,800 interest on other railway bonds.

Want Property Transferred.—Hugh Goodfellow, Warren Olney and W. I. Brobeck, as trustees of the San Francisco-Oakland Terminal Railways, have applied to the California Railroad Commission for authority to transfer to the Key System Transit Company, East Oakland Railway and Oakland & Hayward Railway, the properties formerly belonging to the San Francisco-Oakland Terminal Railways. The Key System Transit Company has also applied to the commission for authority to sell $2,500,000 of first mortgage bonds and to execute a mortgage to the Oakland Bank, as trustees, to secure an issue of $10,000,000, par value, first mortgage bonds, due July 1, 1938, in conformity with the reorganization plan.

The **Indiana Service Corporation, Fort Wayne**, during 1923, carried 20,276,514 revenue passengers. Although the single cash fare on city lines in Fort Wayne is 7 cents, the average fare per revenue passenger was 5⅔ cents through the general use of the "weekly pass."

Interborough Sells Hotel Property.—The Hotel Belmont, New York, was recently sold by the Interborough Rapid Transit Company, New York, N. Y., for approximately $7,000,000 to William Ziegler, Jr. The Ziegler residence in East Sixty-third Street, which is said to have been constructed and decorated at a cost of $1,250,000, was accepted in part payment. It will be resold by the Interborough Company.

Seeks Abandonment.—The Chautauqua Traction Company, Jamestown, N. Y., has applied to the Public Service Commission for authority to abandon that part of its line south of the village of Mayville to a point at the south line of the village of Westfield. The line proposed to be abandoned operates on the bridge in Mayville over the Pennsylvania Railroad tracks, replacement of which is required. The company alleges that its line is not meeting operating expenses and taxes.

Traffic and Transportation

Another Atlanta Hearing on March 4

Public Discussion of Fares Expected to End Then—Terms of Company's Plea Restated

In connection with the work of reporting the hearings on the petition of the Georgia Railway & Power Company, Atlanta, to the Mayor and the City Council looking toward the adoption of a plan designed to put railway operation there on a satisfactory financial basis, sight has at times been lost of the correct aims of the company. Even the ELECTRIC RAILWAY JOURNAL fell into this error in the issue of Feb. 16 in reporting the events of the fifth public hearing. It was stated that the company was asking for an increase in fare from 7 to 10 cents, for the privilege of asking 2 cents for a transfer, and for the elimination of jitneys from the streets on which the railway operates. It was further said that unless these things can be secured, the company has warned the public that it cannot make any extensions or improvements in its service, and may be forced to cease operation.

As a matter of fact the company is merely suggesting seven definite remedies to assist the railway, and has offered, provided the public does not approve any of the plans advanced, to try any fair plan the public thinks will best serve its interest so long as the plan will provide the necessary revenue. Thus the 10-cent fare clause asks only for a 10-cent cash fare, tickets to remain at 6⅔ cents. The definite changes asked in the conditions under which the railway is now operating are as follows:

1. Complete elimination of jitneys from streets upon which street cars are operated.
2. Renewed and effective enforcement of regulation of street traffic.
3. Ten-cent cash fare on street cars; tickets to be sold at the present rate of 6⅔ cents. Car riders will pay no increase in fare if they buy tickets.
4. Two-cent charge for transfers.
5. Reasonable revision in the operating routes of the cars in the interest of more efficient operation.
6. Elimination of unnecessary car stops to effect quicker street railroad service.
7. Relief to the extent necessary from paving charges and gross receipt taxes.

So that there may be no possible misinterpretation of the facts in connection with the matter it has been deemed advisable to set down again that if the city and the public grant its petition the railway will:

1. Submit its books, records and accounts to any fair audit and pay the cost of the same in order that its statements may be verified.
2. Negotiate an agreement between the city representing the public and the street railroad as to what constitutes a living basis and thereafter will operate the street railroad system and buses in co-ordination to the extent necessary to accommodate the traffic under proper supervision of the public and Public Service Commission as efficiently and economically as possible, and will extend and improve the service to the extent its revenue and credit permit, as trustee for the public.
3. Agree to any fair conditions of continuous supervision, representation or auditing the public desires or deems necessary to secure proper administration of the plan agreed to.
4. Agree to maintain the service at the highest standard under the lowest rate of fare that will support it on the living basis agreed to.

The petition was filed with the Mayor and the General Council on Dec. 1, 1923. The recapitulation of its principal provisions at this time appears particularly pertinent as it comes on the eve of the public hearing set for March 4, which is expected to be the last one.

At the sixth hearing on the company's petition, held on Feb. 21, the principal speakers were Marion Jackson, a leader of the Municipal League of Georgia, and Preston S. Arkwright, president of the railway. Mr. Jackson opposed the appointment of John A. Beeler to conduct the survey of Atlanta's traffic conditions. He proposed that the appointment of an engineer to make the local survey be left to Newton D. Baker, former Secretary of War, or to some other prominent man outside of Atlanta. Alderman Bachman, chairman of the special committee of the City Council handling the company's petition, defended the choice of Mr. Beeler by the committee, and refused to change his position in the matter.

Bridgeport Will Join Other Cities in Fare Petition

A hearing is scheduled for March 11 in Hartford on the petition of the Connecticut Company for authority to raise the rate of fare in Bridgeport to 8⅓ cents. At the same time petitions will be heard from New Haven, Hartford, Waterbury, Meriden, Stamford and New Britain, which seek a reduction of the 8⅓-cent charge put into effect on Feb. 10. This hearing will take the place of any local hearing in Bridgeport to which the city might have been entitled. A conference of representatives of several cities decided to ask for a hearing at which the whole subject of rates would be discussed. Reference was made to the probable hearing previously in the JOURNAL

Chicago "L" Extends Non-Stop Service

Special Sunday express service between 10 a.m. and midnight has been started on five branches of the Chicago Rapid Transit Company's system. This service is an extension of the week-day "shoppers' special" trains which were placed in service during the holidays last December to accommodate patrons, especially women shoppers, living in the outlying districts and suburbs. The popularity of the week-day trains during the holidays led the management to continue the service afterward, and now it has been extended to provide the same service on Sundays. Trains are operated between the Loop and some outlying station on each branch without stops in either direction on a thirty-minute headway. Time-tables have been distributed by the agents at the stations at which these trains stop, indicating the exact time the train will depart from each station. The success of the week-day train is attributed to the punctuality and speed of the trains.

Bus Will Replace Emporia Railway

Voters of Kansas Town Decide to Permit Local Company to Make Substitution

Emporia, Kan., a city of 11,000, has authorized its City Commissioners to arrange to substitute buses for the railway. The decision was made after buses had been tried out for several months along the routes where street cars had been running for twelve years. At a referendum election on Feb. 19 the majority for the buses was 353, a substantial number when it is considered that only 1,600 out of an electorate of 5,000 showed enough interest in the election to cast ballots.

The commissioners agreed to submit the question after the buses had been tried out and had met with the approval of the patrons served. Under the agreement made by the Kansas Electric Power Company, operating the local railway, six bus lines will be established instead of the three car lines.

"We found the buses dependable and easy to operate," said Ralph Smalley, manager of the power company. "We found them slightly more expensive to run that the street cars, but to offset that they carried more passengers, and we believe when the new lines are well established we can turn our transportation system from one that is losing money to one that will earn money, or at least break even."

Three or four days before the election, a driving snowstorm covered the car tracks, and with the thermometer at zero the cars were unable to run. The buses, however, maintained schedule and won friends for the new form of transportation. Another factor was the vote from a portion of the city not served by the car lines. Here the vote was especially heavy for the buses, the people realizing that the power company could not be induced to extend its railway while it was losing money, and they voted for the buses as their only opportunity to obtain service. Patrons of a line which extends into a ward where the streets are not paved, however, voted almost solidly against the buses, basing their action on the contention that the buses cannot run on muddy streets, and in rainy weather their service would be stopped.

According to the ordinance approved at the referendum the power company will pay the city a stated sum for tearing up the car tracks, the company to be relieved forever of paving maintenance.

Two bus lines already are in operation and the other lines will be established as soon as the company decides on the type of bus it will use.

Bus Certificate Refused.—For the same reason that it refused a certificate to the Red Star line to operate a bus line between Columbus and Chillicothe, Ohio, the Public Utilities Commission has also withheld a certificate from the same company to establish bus transportation between Columbus and Portsmouth. The Scioto Valley Traction Company testified that the proposed routes followed its right-of-way.

Parlor Car Service Started.—Parlor car interurban service was established by the Milwaukee Electric Railway & Light Company on Feb. 27 between Milwaukee and Waukesha. This new service will be in addition to the company's regular railway and bus service. An interesting feature is the plan of the company to institute a postcard referendum on the cars by which it will seek to determine the most desirable time schedules in order to make the new service as convenient as possible.

Buses May Replace Cars.—Buses will supplant trolley cars of the Galesburg Railway, Light & Power Company between Galesburg and Knoxville, Ill., on April 1, if the Illinois Commerce Commission approves. The railway operates over a highway which is to be surfaced with concrete and the state highway department has ordered the company to vacate by April 1. It is expected that the bus service will be permanent. Later it may be extended to Abingdon, should permission be given to abandon the railway between Knoxville and Abingdon.

Keeps to Decision of Voters.—The City Commission of Muskegon, Mich., recently reiterated its views, through Commissioner Paul R. Beardsley of the transportation committee, that bus service must not compete with the electric railway service. The occasion for the City Commission again taking this stand was the coming up of a petition for extending a bus line. The commissioner said the city would abide by the vote of the people, who decided some time ago by a vote of ten to one that cars should be retained and competing bus lines removed.

Higher Fare Asked by North Carolina Road.—In order to take care of the loss which, officials say, has been occurring steadily for many months in the operation of its Wilmington lines, the Tide Water Power Company plans to file with the State Corporation Commission an application to increase its fare from 7 to 8 cents, with two tickets for 15 cents. Announcement to this effect was made by F. A. Matthes, executive vice-president of the Tide Water company, at a general meeting of the Chamber of Commerce.

Buses for Interurban Traffic.—Looking toward a new way of handling interurban traffic on the Chicago, South Bend & Northern Indiana Railway, R. R. Smith, general manager, has announced that the company has sent out calls for bids for buses to be operated between South Bend, Elkhart and Goshen, Ind., on one route and South Bend and Niles, Mich., on another, as part of the interurban system. Mr. Smith said that the company had under consideration placing buses on South Bend, Laporte and Michigan City lines.

Legal Notes

FEDERAL COURTS—*Statute Penalizing Employer Who Makes Non-Membership in Union Condition of Employment Held Unconstitutional. Clayton Act Does Not Prohibit Injunction Against Union Officials Not Party to Dispute.*

This case relates to strikes called on the Pacific Electric Railway by the Brotherhood of Railroad Trainmen and the Brotherhood of Locomotive Engineers in July, 1918, and in August, 1919. The case was decided in the District Court in favor of the company, but was appealed, and the decision was affirmed Nov. 13, 1923, by the Circuit Court of Appeals, Ninth Circuit. Among the points decided was the unconstitutionality of Sec. 679 of the Penal Code of California, which provides that any employer or his agent who shall compel any person to agree not to join any labor organization as a condition to secure or continue in employment shall be guilty of a misdemeanor. This law, in view of 35 Sup. Ct. 240, was held by the Circuit Court to be repugnant to the due process clause of the Fourteenth Amendment and therefore void. Another point decided was in connection with an injunction issued by the District Court restraining the railroad brotherhood officials and others from interfering with the company's business and with contractual relations with its employees, who were under agreement not to join any labor organization. The brotherhood officials claimed that this injunction was in violation of Sec. 20 of the Clayton act prohibiting injunction against certain acts and disputes between employer and employee. But in view of the fact that none of those against whom the injunction issued were employees and that the company at no time had had relations with either of the labor organizations which these officials represented the Circuit Court held the injunction was proper. It pointed out in this connection that "the right of the employee to strike does not give the outsider the right to instigate a strike," and quoted 38 Sup. Ct. 65, 72. [Montgomery et al vs. Pacific Electric Railway, 239 Fed. Rep., 680.]

FEDERAL COURTS—*Property Covered by a Contract to Lease and Equip a Railway.*

In 1892 the Ninth Avenue Railroad and in 1895 the Eighth Avenue Railroad, then horse railways, were leased for long periods to the New York Railways, under an agreement by which the latter company agreed to equip the lines electrically and return to them at the termination of the lease. In the case of the Eighth Avenue line this return was to cover "all property of every kind used by the said lessee in the maintenance and operation" of the railway. The Ninth Avenue lease declared that all the cars, etc., which the lessee should "provide, purchase, substitute, or supply" for the operation, should revert to and become the property of the lessor. During its operation of these lines the New York Railways used many cars over all or part of the lines, and the suit in question was brought to determine what equipment must be turned over to these companies after the New York Railway passed into the hands of a receiver in 1919. The court decided that where delivery in kind, as with cars, could be made, the number to be supplied could be determined on a pro rata car mileage basis. Another question arose when, on the whole system operated by the lessee, say, one machine of a certain kind was used, and such a machine was necessary and proper or even suitable on the former leased lines. Then, if such a machine was not supplied, there was a breach of covenant, for which pecuniary compensation may be demanded. For such claims, however, the lessors are on the basis of the general creditors of the company. Since materials, equipment, and supplies of public utility corporations are not regarded as chattels in the ordinary sense because needed to enable quasi public corporations to carry out their franchise duties, the rights of lessors, as against a lessee of lines operated as a unit, to apportionment of cars and equipment on termination of leases, are not affected by any rights of general creditors, who relied on the possession of the property by the lessee when they extended credit to it. [New York Railways et al vs. Eighth Avenue Railroad et al; same vs. Ninth Avenue Railroad et al., 293 Federal Rep., 633 (See also 612).]

GEORGIA—*Duty as to Safe Place for Passengers to Alight Stated; Directing Passenger to Alight From Left Side of Street Car Held Not Negligence in Itself.*

In looking to the safety of its passengers, the street railway must exercise proper caution, not only to see they leave the car safely but have a reasonably safe place at which they may alight. But where a passenger was struck by an automobile soon after he had left the car, the mere fact that he had been directed to leave the car from its left side could not be accounted negligence on the part of the company, in the absence of any further and additional allegation indicating how or why. [Jernigan vs. Georgia Ry. & Power Co., 120 Southeast. Rep., 439.]

KENTUCKY—*Passenger Stepping Off Car Into Way of Automobile Contributorily Negligent.*

Assuming that the opening of the door of the vestibule was an invitation to alight, a passenger stepped through the door in broad daylight, while the car was moving very slowly, with the result that he was struck by the rear fender of an automobile traveling in the same direction. The court held that he was guilty of contributory negligence, the danger being obvious and apparent. [Twaddell's Adm'r. vs.

South Covington & C. St. Ry Co., 255 Southwest Rep., 1027.]

MICHIGAN—*Franchise Requirement for Paving Will Be Enforced.*

Where a franchise requires that the company pave between the rails and the village pave the rest of the streets, this paving must be done by the company even if the street is taken over for a county road and the county paved 16 ft. and the village 12 ft. Financial inability of the company to perform this obligation does not relieve it from such duty or prevent a forfeiture of the franchise, even though such forfeiture will operate to the detriment of other municipalities and interfere with the public duties of the railway as a common carrier. Where the franchise is for single or double track, it may take up the double track and establish a single track, but this does not change its obligation for the paving fixed by existing double track, and the village has put in its share of the paving. A franchise requiring paving of the streets between the rails does not require paving of the devil strip or to the ends of the ties. [Village of Grandville vs. Grand Rapids, Holland & Chicago Railroad, 196 N. W. Rep., 351.]

WISCONSIN—*Under Condemnation Proceedings, the Offer of a Railway to Grade and Surface Property Not Considered in Fixing Damages, but Condemnation of Special Easement Permissible.*

In order to build a second track, a railway company condemned a triangle constituting the greater part of the frontage of a city lot and agreed to grade and surface the property to be condemned and maintain it in such condition in the future, under penalty of forfeiture if there was a breach of the conditions. This offer was urged in diminution of the damages to be paid. But the court held that such a plan was not desirable, because the question of maintenance of proper grade of the surface might involve serious dispute in the future, and a forfeiture clause is not favored in law, and might also lead to numerous lawsuits. There was no objection, however, to the condemnation by the electric railway of a special easement. [Milwaukee Electric Railway & Light Co. vs. Becker et al., 196 Northwest Rep., 575.]

UTAH—*When on a Public Street a Car Should be Under Such Control that it Can Be Stopped When the Headlights Disclose an Automobile Ahead.*

The part of a public street occupied by street car tracks remains a part of the street, though not paved, and one entering thereon is not a trespasser. Hence, it was the duty of a motorman operating at night, during a rain storm, along such a route, to have his car under such control that he could stop it within the distance that his headlights would disclose an automobile on the track, as the unpaved part of the street was separated by curbs from the paved portions. [Kakunis vs. Ogden Rapid Transit Co., 221 Pacific Rep., 853.]

Personal Items

Wickwire Made "O. B." Vice-President

Well-Known Secretary of Ohio Brass Company Recently Elected to New Office

Edward F. Wickwire, secretary of the Ohio Brass Company, than whom few men in either the electric railway or electric light and power industries are better known, has been elected vice-president of that company. Mr. Wickwire is one of those men who appears to be everywhere and in everything, and always with him go new ideas (and a pleasing wit). In a dynamic sense he is Rooseveltian. But there is no intention here to attempt to build up a comparison by any method vidious or invidious, Plutarchian or otherwise. So far as his connection with the Ohio Brass Company is concerned, Mr. Wickwire has been with that company since 1903. In fact, he has been connected with the manufacturing end of electric railway work practically all his business career.

E. F. Wickwire

Mr. Wickwire was only twenty-two years old when he started traveling for the Sterling Supply & Manufacturing Company, New York, which manufactured fare registers, safety brakes and other electric railway specialties. After he had been on the road about two years the Sterling Supply & Manufacturing Company absorbed the Meaker Manufacturing Company, Waukegan, Ill., and changed its name to the Sterling-Meaker Company. Mr. Wickwire was made secretary and general sales manager of the company at the time of the merger, but in 1903 he resigned that position to become identified with the Ohio Brass Company, in charge of sales in the Middle West territory.

Before he left school in his home town of Cohoes, N. Y., Mr. Wickwire took a trip to New York and observed the fact that a newspaper became "stale" in the metropolis fifteen minutes after it was off the press. This led him to figure out that people back home in Cohoes were reading history instead of news because they bought New York morning papers and read them in the evening—that being the only time that most people in a factory town had time to read the daily paper. To think is to act with Mr. Wickwire and so he secured the agency for the New York *Evening Journal* and introduced that paper in his home town and succeeded in building up quite a "respectable" circulation.

As a result of this venture, he shortly afterward secured a place in New York in the circulation department of the *Evening Journal.* Later he had some experience in newspaper reporting work. Whether or not a spirit of contrition for any of his past journalistic acts had anything to do with it, Mr. Wickwire next got himself a job as secretary to the president of the New York, Ontario & Western Railroad, among the emoluments of which position were free transportation not only in this country but abroad. However, he had no time to go or money to spend when he got there—just the reverse of the well-known "all dressed up" bromide.

Incidentally his "wim, wigor and witality" caused him to join the Twenty-second Regiment, N. G. N. Y., and he volunteered with that regiment for service in the Spanish-American War. His mother appealed to Mrs. McKinley and his discharge was ordered, but he said it took more nerve to withdraw than it did to proceed and finally convinced his mother that it was his duty to see it through. He was transferred to the Seventh Artillery of the Regular Army, stationed at Fort Slocum, where he claims he performed his duty to his country by helping to prevent the Spanish Mackerel from invading Manhattan Island.

Mr. Wickwire's work on the entertainment, publicity and membership committees of the American Electric Railway Association is well known. This year he is a member of the A.E.R.A. executive committee, publicity committee, committee on interurban operation, committee on city operation and is chairman of the committee on co-operation of manufacturers. He has also very recently been made chairman of the publicity committee of the Central Electric Railway Association.

Mr. Wickwire is also active in civic work in Mansfield, for he is not like the prophet in his home town. He has staged lots of entertainments for the Elks, the Country Club, the Auto Club and for miscellaneous events. He was really the organizer of the Richland County Auto Club and its first president. He is also a vice-president of the Ohio State Automobile Association. He has been active in connection with his automobile affiliations in getting adequate bus and truck regulation in Ohio.

This, however, is really a statement of only part of the activities of the man. As the facts that have been set down indicate, Mr. Wickwire has been both a maker of events and a recorder of them. It is quite natural, therefore, that his experience, combined with his unusual natural talents, should result in Mr. Wickwire being called upon to serve in connection with all the multifarious activities noted previously, which after all, as just indicated, is only a cursory list.

J. W. Gerke Goes Into Equipment Business

J. W. Gerke, familiarly known as "Jake" Gerke to thousands of railway men, has opened a sales office at 303 Fifth Avenue, New York, N. Y., from which he will handle the sales of new and used equipment of all description suitable for the electric railway industry. Mr. Gerke recently retired from the Transit Equipment Company. Before this he represented the Texas Company for three years, selling Texaco lubricants to the railways.

Mr. Gerke is familiar with all phases of street railway operation, as he has had twenty-one years experience in the construction and operation of street railways in the Middle West and in the East. During this time he served as superintendent of maintenance of the New York & Queens County Railway, Long Island City, N. Y., and as superintendent of equipment for the Long Island Electric Railway and the New York & Long Island Traction Company. Back in 1909 Mr. Gerke acted as master mechanic of the Tri-City Railway, Davenport, going to that position from Washington, D. C., where he served as superintendent of the Washington, Arlington & Falls Church Railway. Following his connection with the Davenport property he became master mechanic of the Wilmington & Philadelphia Traction Company, with headquarters at Wilmington, Del.

C. E. Wilcox Appointed to Handle Municipal Railway Claims

Clarence E. Wilcox, Corporation Counsel for the city of Detroit under former Mayor James C. Couzens and under Frank E. Doremus, the present Mayor, has been appointed head of the claims division of the Department of Street Railways at Detroit by the Street Railway Commission.

Mr. Wilcox was active under former Mayor Couzens in drawing up the ordinances which were approved by the voters bringing the Department of Street Railways into existence. The appointment of Mr. Wilcox was approved by acting Mayor Joseph A. Martin. He will supervise all damage suits against the D. S. R. Mr. Wilcox resigned a short time ago to enter private practice.

John Meagher has been appointed purchasing agent, succeeding J. M. Pogue, of the Indiana, Columbus & Eastern Traction Company. Mr. Pogue was recently promoted to manager.

William G. Marshall Succeeds the Late Cecil G. Rice in Pittsburgh

William G. Marshall has been appointed manager of the associated bureaus and superintendent of the claims department of the Pittsburgh Railways, to succeed the late Cecil G. Rice. Mr. Marshall has been in the employ of the Pittsburgh Railways since 1916, following a year in the law office of Burleigh & Challener. He was born in Pittsburgh, March 17, 1888. He attended the Wilkinsburg public and high schools. He was graduated from Washington and Jefferson College in 1911 and from the University of Pittsburgh law school in 1914. The same year he was admitted to the bar in Pittsburgh.

W. G. Marshall

James Mangan, formerly superintendent of the railway department of the Rutland Railway, Light & Power Company, will assume charge of the transportation department of the Ephrata & Lebanon Traction Company, Lebanon, Pa., effective March 1.

Robert K. Brown, superintendent and chief engineer of the Salt Lake & Utah Railroad, Salt Lake City, Utah, has been elected president of the Engineering Council of Utah, to succeed Dr. Joseph F. Merrill. The Engineering Council of Utah is composed of representatives from all societies of professional engineers in Utah.

Charles S. Crable, for the last three years superintendent of equipment of the Jamestown Street Railway, Jamestown, Westfield & Northwestern Railroad and the Chautauqua Traction Company, Jamestown, N. Y., will resign on March 1. Mr. Crable will assume the presidency of the Jamestown Welding & Brazing Company, Jamestown.

Neal Nash, who has been connected for many years as manager of the Wisconsin Rapids Street Railroad's properties, which furnish service in Wisconsin Rapids and interurban electric railway service to Nekoosa and Port Edwards, announces his resignation from the managership of that company to accept a position on the salesforce of a Chicago paper company. L. M. Nash, president of the company, announces that Mr. Nash will be succeeded as manager by L. C. Wipperman, who for many years has been in charge of the company's south side carhouses and rolling equipment. Mr. Wipperman in turn will be succeeded by Joseph Nash, to be in charge of the south side carhouse.

George Donley, Orange, Mass., has been chosen superintendent of the Athol & Orange Street Railway, which goes under municipal operation on March 1. The appointment was made on Feb. 23 by the new board of trustees, of which W. W. Woodward, Athol, is chairman. Mr. Donley has been with the Athol & Orange road during practically the entire time of its operation, working as a platform man and in other capacities. He was assistant superintendent when the line became part of the Northern Massachusetts system.

Frank E. Marsh, for ten years superintendent of the Northern Massachusetts Street Railway, has retired from service with the Templeton division, recently purchased by a company headed by Charles Melhardo. Mr. Marsh is still in charge of the Athol & Orange section. It was about ten years ago, when the Connecticut Valley system took over the Northern Massachusetts lines, consisting of the Templeton Street Railway, the Gardner, Westminster & Fitchburg and the Athol & Orange, that Mr. Marsh was on the ground as active superintendent. At that time J. A. Taggart, who was superintendent of the Connecticut Valley lines, assumed the title of general manager of the Northern Massachusetts as well as the Connecticut Valley, but he spent most of his time in Greenfield.

Obituary

James H. Nichols, one of the incorporators and original owners of the Denver Tramway, Denver, Col., who left Denver in 1919 to take up his abode in California, died recently at the age of eighty-one.

Charles H. Lake, chief engineer of the plant of the Ohio Valley Electric Railway at Kenova, W. Va., died suddenly while on duty at the plant on Feb. 13.

Dr. Plimmon Henry Dudley, prominent inventor of improvements in railroad engineering, died on Feb. 26 in the Hotel Commodore, New York, in his eighty-first year. Making rail transportation safe was a hobby of his. He invented the track indicator in 1880 to detect track defects. In that same year he became consulting engineer for the New York Central and had remained continuously with that road. Doctor Dudley was born in Freedom, Ohio. He was educated at Hiram College. He designed the first 5-in. steel rail used in the United States, high carbon rails and 6-in. 100-lb. rails. He made a special study of rails, including their composition, strength and form. The ELECTRIC RAILWAY JOURNAL has reproduced Doctor Dudley's opinions where they dealt with subjects bearing on electric railway transportation.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Birney Club's Second Year

Arranges St. Louis Convention Details—Fraternal Body Becoming Factor Among Manufacturers

Through the Birney Club, which was organized in January, 1923, the manufacturers of electric railway equipment in the St. Louis district have been brought together and are now co-operating in a really constructive program for the industry. At the second annual meeting of the club, held Jan. 30, 1924, the following officers were elected: C. O. Birney, president; Edwin B. Meissner, vice-president; B. W. Stemmerich, secretary; O. E. Turner, treasurer. They have all held office since the foundation of the club and it was felt that they should be re-elected because the results achieved during the first year of the club's life warranted continuation of the same officers for another year.

Until St. Louis was selected for the Midyear Meeting of the American Electric Railway Association only a few people outside of that city really knew that there was such a thing as a Birney Club. When announcement was made that the bulk of the local work in connection with that meeting would be looked after by members of the Birney Club there were many who asked, "What is the Birney Club?" But those in St. Louis and the vicinity have appreciated for some time the tremendous good that this club is doing and its sphere is so steadily broadening that it is now receiving national recognition.

As the name indicates, the foremost figure in the club and the one most influential in its original organization is Charles O. Birney, superintendent of car construction, Stone & Webster, Inc. The club is really an outgrowth of the gathering together of those interested in the Birney safety car. As time has passed, the movement has widened so that, although the original idea is still kept in mind, it is today a club devoted primarily to fostering friendship and fellowship among its members and the promotion of the best interests of the electric railway industry.

There is no question but that the Birney Club has brought about a close personal friendship among all its members, of whom the great majority are competitors one with another. The members are still keen competitors, but with a spirit different from that previously apparent. The spirit of fair dealing, one with the other, is uppermost in their minds. The fact that all the members of the Birney Club are closely co-operating and are interested in the electric railway industry made it possible for this club to be the foundation stone of the local organization to take care of the Midyear Meeting. Every member of the Birney Club is a working member of the local midyear committee and practically all the important sub-committees are headed by members of this club.

The Birney Club will have in evidence at this meeting two new rubber-tired safeties which will be used for the convenience of the guests and will be objects of interest to all those attending.

A meeting of the club held Feb. 25 approved a new constitution which provides that membership shall be open to the electric railway industry and "allied interests," leaving it open to the membership to decided from time to time just what constitutes allied interests.

Collier Gets B.-M.T. Concession

The New York Transit Commission on Feb. 28 approved a proposed contract between the Brooklyn-Manhattan Transit Corporation and Barron G. Collier, Inc., covering the advertising and vending privileges upon the lines of the company. Commissioners Harkness and O'Ryan voted to approve the contract, while Chairman McAneny voted in the negative.

Under the Collier contract, which is for a period of fifteen years, the company will receive a minimum of $15,000,000, divided $4,500,000 for the first five years, $5,000,000 for the second five years and $5,500,000 for the third five years.

The proposed contract for advertising and vending privileges was submitted to the commission early in January by the New York Rapid Transit Corporation (B.-M. T.) after lengthy negotiations between the company and Barron G. Collier, Inc., in which it was developed that a much larger profit could thus be made from these privileges upon the company's lines than was apparently possible through their exercise by the company's own organization, the Broadway Subway and Home Boroughs Car Advertising Company, which had carried on the business for several years. The commission points out that there is a public interest in these profits, in the sense that the larger the revenue derived by the company from all of its operations the nearer comes the day when the city may begin to realize a direct return financially upon its investment in the lines.

The first Collier offer proposed a base rate of $800,000 a year for fifteen years, with certain increments based upon possible increases in gross sales, which was a substantial increase over the best profits ever made by the company's own organization. When the contract with Collier came before the Transit Commission for approval, and thereupon became public information, three other advertising concerns became very active for the privilege and offered bids higher than Collier's. The commission directed that these figures should be used as the basis of negotiating a new contract. Later the company submitted a new contract with Collier at the figures named above. This contract also provides for further payments to the company based on earnings which result in a potential increase of $500,000 over the period of the contract. There was a rather heated contest before the commission, but the contract was said to have been finally awarded on the basis of probable performance.

ELECTRIC RAILWAY MATERIAL PRICES—FEB. 27, 1924

Metals—New York

Copper, electrolytic, cents per lb.	13.125
Lead, cents per lb.	9.00
Nickel, cents per lb.	28.00
Zinc, cents per lb.	7.15
Tin, Straits, cents per lb.	54.875
Aluminum, 98 to 99 per cent, cents per lb.	27.00
Babbitt metal, warehouse, cents per lb.:	
Fair grade	60.00
Commercial	28.00

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads	$4.725
Somerset mine run, Boston	2.325
Pittsburgh mine run, Pittsburgh	2.125
Franklin, Ill., screenings, Chicago	1.95
Central, Ill., screenings, Chicago	1.50
Kansas screenings, Kansas City	2.25

Track Materials—Pittsburgh

Standard Bessemer steel rails, gross ton	$43.00
Standard open hearth rails, gross ton	43.00
Railroad spikes, drive, Pittsburgh base, cents per lb.	3.10
Tie plates (flat type), cents per lb.	2.60
Angle bars, cents per lb.	2.75
Rail bolts and nuts, Pittsburgh base, cents, lb.	4.125
Steel bars, cents per lb.	2.40
Ties, white oak, Chicago, 6 in.x8 in.x8½ ft.	$1.70

Hardware—Pittsburgh

Wire nails, base per keg	3.00
Sheet iron (28 gage), cents per lb.	3.85
Sheet iron, galvanized (28 gage), cents per lb.	5.00
Galvanized barbed wire, cents per lb.	3.80
Galvanized wire, ordinary, cents per lb.	2.75

Waste—New York

Waste, wool, cents per lb.	.15
Waste, cotton (100 lb. bale), cents per lb.:	
White	12–18
Colored	9–14

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), per gal.	$0.96
White lead (100 lb. keg), cents per lb.	12.00
Turpentine (bbl. lots), per gal.	$1.02
Car window glass, (single strength), first three brackets, A quality, discount*	84.0%
Car window glass, (single strength), first three brackets, B quality, discount*	86.0%
Car window glass, (double strength) all sizes, A quality, discount*	85.0%
Putty, 100 lb. tins, cents per lb.	4–6

*These prices are f.o.b. works, boxing charges extra.

Wire—New York

Copper wire base, cents per lb.	15.50
Rubber-covered wire, No. 14, per 1,000 ft.	$6.60
Weatherproof wire base, cents per lb.	17.75

Paving Materials

Paving stone, granite, 4x8x4, f.o.b.	
Chicago, dressed, per sq.yd.	$3.60
Common, per sq.yd.	3.20
Wood block paving 3½, 16 treatment, N. Y., per sq.yd.	2.56
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots	54.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd.	1.85
Cement, Chicago consumers' net prices, without bags	2.20
Gravel, ¾-in., cu.yd., f. o. b. N. Y.	2.00
Sand, cu.yd., N. Y.	1.25

Old Metals—New York and Chicago

Heavy copper, cents per lb.	10.75
Light copper, cents per lb.	9.125
Heavy brass, cents per lb.	6.00
Zinc, old scrap, cents per lb.	4.00
Yellow brass, cents per lb. (heavy)	6.00
Lead, cents per lb (heavy)	7.50
Steel car axles, Chicago, net ton	$20.25
Cast iron car wheels, Chicago, gross ton	21.25
Rails (short), Chicago, gross ton	22.25
Rails, (relaying), Chicago, gross ton	26.50
Machine turnings, Chicago, gross ton	12.75

Denver Attracts Missouri Car Company Interests

Orrin Merry, president of the Missouri Car Company, East St. Louis, has announced at Denver that within a short time his company expects to begin the erection of a $750,000 car equipment shop in the outskirts of Denver. The site for the plant is said to have been selected. The works will take up 12 acres. It is said that the concern will be known as the Colorado Central Railways. It is planned to incorporate under the laws of Colorado, with a capital of $500,000. M. L. Phelps will be the consulting engineer.

It will be recalled that the affairs of the Missouri Car Company have recently been under official inquiry. During this investigation Mr. Merry explained that the company had no orders at that time for cars, but he ascribed this to lack of capital with which to begin operations. He said that he took charge of the company's affairs last May under control vested in him by the stockholders and that one of his first official acts was to dismiss the force of stock salesmen, through whom $178,000 of stock had been sold, most of it locally and some of it at commissions as high as 25 per cent. He further said that he had always worked to conserve the assets of the company. Mr. Merry was formerly with Durant Motors.

Manufacturer Co-operates by "Post" Advertising

An excellent example of co-operation of a manufacturer with the electric railway industry is contained in the March 1 issue of the *Saturday Evening Post*. The Westinghouse Electric & Manufacturing Company has a full-page, two-color advertisement which carries to the more than two million readers of the *Saturday Evening Post* the message that "You need street cars." The copy under this caption follows:

> How do you suppose the great bulk of the people in your town get about on their errands of business and pleasure? You may go in your automobile—but most people ride in street cars! Street cars are the links in the endless chain of transportation that bind your community together for business, social and industrial growth.
>
> Given a square deal, which is all it asks, your electric street railway company will be a tremendous factor in the growth, progress and prosperity of your community, whether it is large or small. You and all other citizens will act in your own interests if you make sure that your street railway company always has a fair chance to provide the kind of service your community needs.
>
> Many of the technical problems that have surrounded the development of street cars to their present state of efficiency have been solved by Westinghouse Engineering. Many more problems, apparently insurmountable today, will be solved by them in the future. With your interest and helpful co-operation—and that of our citizens as well—it will always be possible for your community to enjoy the resulting economy and the increasing efficiency of the street car.

Rolling Stock

Community Traction Company, Toledo, Ohio if Commissioner Cann's plan is approved, will spend $157,000 for overhead equipment and cars for the trackless trolley line and $76,000 for the double-deck buses for that line.

Tygarts Valley Traction Company, Grafton, W. Va., during the year just ended purchased two additional safety cars.

Illinois Power & Light Company, Chicago, Ill., recently purchased for one of the interurban lines of the Illinois Traction System seventeen lightweight double-truck cars weighing approximately 36,000 lb. equipped, each with a seating capacity of fifty-two persons. The cars are to be equipped with four motors, type GE-265, form 4, 35 hp., prepared for 4½-in. axle, 26-in. wheels and K-35 single-end control with DB-981 line breaker. The new cars will replace very heavy cars, equipped with GE-73 motors. These motors and control will be incorporated in old passenger cars rebuilt for locomotive service.

Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., has ordered ten single-deck coaches from the Yellow Coach Manufacturing Company, Chicago.

Springfield Street Railway, Springfield, Mass., will shortly purchase four additional buses in anticipation of the independent jitneys being banned May 1. The new buses will be of from twenty-five to thirty-passenger capacity.

Boston Elevated Railway will spend $10,000,000 for rolling stock if suggestions of trustees receive legislative sanction.

General Electric Company, Schenectady, N. Y., recently received orders from the Detroit United Railway, Detroit, Mich., for motors and control to be used on a standardized medium-weight type of car which it was recently decided to adopt. These cars, ten of which have been purchased, will be operated on four major divisions. The new cars are 56 ft. long, seat fifty-four persons and weigh about 64,000 lb. each, fully equipped. Each car will be equipped with four GE-275-E, 600-volt, 60-hp., tapped-field motors and PC-5 single-end control. A Universal equipment will be used, geared for about 48 m.p.h., on 600 volts, thus allowing an economical application to limited, express and local service on all four divisions.

British Columbia Electric Railway, Vancouver, B. C., through the British Columbia Rapid Transit Company, its subsidiary, has placed orders for five Fageol buses and one White bus. The six buses will be ready for service on May 1. They will cost $12,400 each. The new buses will seat twenty-two passengers and have a baggage compartment.

Pittsburgh Railways, Pittsburgh, Pa., will place within a day or two an order for 140 standard center entrance city cars. It is reported that the company will shortly place another order for forty-three one-man, two-man single-entrance cars, forty-five one-man, two-man double-entrance cars and fifteen interurban cars, making 103 cars in all. These orders are part of the general rehabilitation plan mentioned in the ELECTRIC RAILWAY JOURNAL, issue of Feb. 2.

Track and Line

New Brunswick Power Company, St. John, N. B., has under consideration the construction of an extension to the electric railway operated since the acquisition of the lines of the St. John Street Railway. It has been proposed that a line be built to Millidgeville.

Pacific Electric Railway, Los Angeles, Cal., has been ordered to lower its tracks to specific grade level on American Avenue between Anaheim Street and North Long Beach. The company must eliminate curbs and pave the avenue full width from curb to curb.

Tygarts Valley Traction Company, Grafton, W. Va., during 1923 relaid its track on Main Street and Walnut Street with steel ties, new joints and bonds, in a concrete base. The company also replaced the old wooden structure under the Dorsey Street Bridge, over the Baltimore & Ohio tracks, with a substantial steel structure.

Wisconsin Traction, Light, Heat & Power Company, Appleton, Wis., will make track and roadbed improvements on Third Street in Menasha, Wis., in connection with the proposed plan of the city to pave this section of the city as soon as weather conditions permit.

Trade Notes

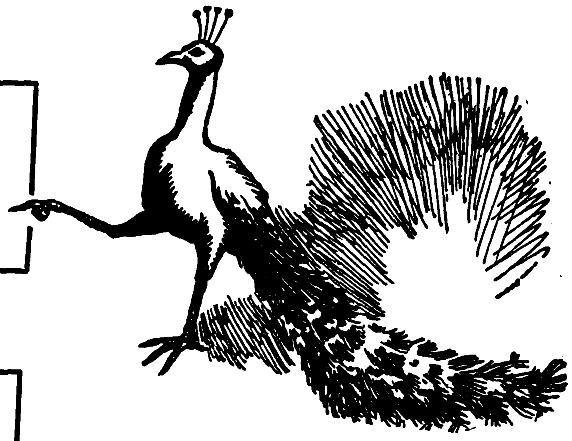
Chester F. Gailor, New York, N. Y., announces that he is no longer connected with the Rail Welding & Bonding Company, but that he will continue to handle reliable and practical welding, grinding and bonding machines and accessories, as well as general track tools and equipments produced by the Railway Track-Work Company, the Liteweld Company, the Witherow Steel Company, General Grinding Wheel Corporation, Stackpole Carbon Company and welding rod and joint plate concerns.

Hardwood Manufacturers' Institute, Chicago, Ill., will hold its second annual convention at the Seelbach Hotel, Louisville, Ky., May 8 and 9. Special attention is being given to the development of an attractive program dealing with subjects of mutual interest to all branches of the industry. A most cordial invitation is extended to other manufacturers as well as to the consumers and distributors of hardwoods.

S. B. Thayer Son & Company, Washington, D. C., will move their office on March 1 to suite 308-316 Bond Building, Washington, D. C. The change is necessary because of the necessity for more office space than is available in the Munsey Building. The company has been established more than eighty years and is equipped for work in connection with engineering, organization, hydro-electrics, industrial development, railroad construction, short railroads or extensions to develop a resource or industry, and the arrangement of bond issues upon sound operating properties.

Ohmer Fare Register Company, Dayton, Ohio, recently announced the appointment of J. F. Ohmer, Jr., as third vice-president.

PEACOCK STAFFLESS BRAKES



MOST POWERFUL

Peacock Brakes have three times the braking power of ordinary equipment.

FAST

Peacock Staffless Brakes are rapid and effective. They stop the cars in the shortest time.

GREAT CAPACITY

There is enough room in the big housing to take up almost unlimited amounts of chain. Worn brake shoes or slack rigging cannot prevent holding because this brake overcomes all slack.

SAVES SPACE AND WEIGHT

Peacock Staffless Brakes weigh only 72 lbs. and take up minimum platform space.

LEAST MAINTENANCE

Peacock Brakes usually outlive the car. Graphite Bronze Bushings eliminate periodic oiling.

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canada:—Lyman Tube & Supply Co., Ltd., Montreal

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

The J. G. White
Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants,
Steam and Electric Railroads, Buildings and
Industrial Plants, Transmission Systems.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation
Management
52 Vanderbilt Ave., NEW YORK

A. L. DRUM & COMPANY
Consulting and Constructing Engineers
VALUATION AND FINANCIAL REPORTS
RATE STUDIES FOR PRESENTATION TO PUBLIC SERVICE COMMISSIONS
CONSTRUCTION AND MANAGEMENT OF ELECTRIC RAILWAYS
230 South Clark Street Chicago, Ill.
215 South Broad Street Philadelphia, Pa.

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation,
Studies on Financial and Physical Rehabilitation
Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and
Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. Richmond, Va.
Established Feb. 1913.

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

J. ROWLAND BIBBINS
Engineer—921 Fifteenth St., WASHINGTON, D. C.
TRANSPORTATION
Complete Transit Surveys and Development Programs, adapting Motor-Transport, R.R. Terminal and City Plans. Traffic, Service, Routing, Operation and Valuation. EXPERIENCE IN 20 CITIES

Parsons, Klapp, Brinckerhoff & Douglas

WM. BARCLAY PARSONS H. M. BRINKERHOFF
EUGENE KLAPP W. J. DOUGLAS

Engineers—Constructors—Managers

Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports

CLEVELAND
1570 Hanna Bldg.

NEW YORK
84 Pine St.

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors SYRACUSE, N. Y.

KELLY, COOKE & COMPANY

Engineers

149 BROADWAY
NEW YORK

424 CHESTNUT STREET
PHILADELPHIA

DAY & ZIMMERMANN, INC.

ENGINEERS

Design, Construction
Reports, Valuations, Management

NEW YORK PHILADELPHIA CHICAGO

C. B. BUCHANAN
President

W. H. PRICE, JR.
Sec'y-Treas.

JOHN F. LAYNG
Vice-President

BUCHANAN & LAYNG CORPORATION

Engineering and Management, Construction, Financial Reports, Traffic Surveys and Equipment Maintenance

BALTIMORE
825 Equitable Bldg.

Phone:
Hanover 2142

NEW YORK
49 Wall Street

The Most Successful Men in the Electric Railway Industry read the

ELECTRIC RAILWAY JOURNAL

Every Week

THE P. EDWARD WISH SERVICE

50 Church St.
NEW YORK

Street Railway Inspection
DETECTIVES

131 State St.
BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

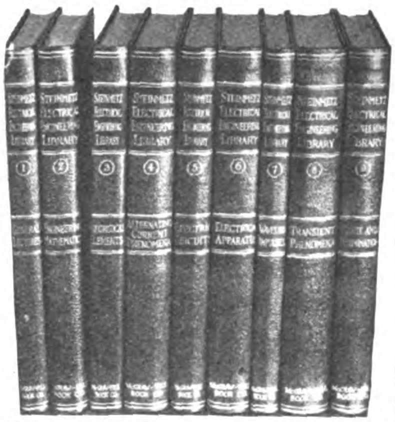
Put STEINMETZ in *Your* Library—

THE nine volumes which Dr. Steinmetz has contributed on the subject of electrical engineering are now available in a handsome specially bound set. To those who know what these great books have meant in the development of electrical engineering theory and practice—this announcement needs no elaboration. The Steinmetz books have been called the foundation of electrical practice. Their recognition is worldwide. In Europe, Japan, South America—in every corner of the globe—they are accepted standards and guides.

Have this handsome set with its full treatment of the theory and special problems of electrical engineering at your command. The handbook and the practical treatise may give you the simple fact you need—but Steinmetz gives you the theory and its application—the real solution of the problem.

See these books for 10 days FREE

You can examine the STEINMETZ ELECTRICAL ENGINEERING LIBRARY for ten days free. Simply fill in and mail the coupon below. This will not obligate you to purchase. You merely agree to return the books, postpaid, in ten days, or to remit $4.00 in ten days and $4.00 per month for eight months. Take this opportunity to see for yourself what these books are and how useful they could be to you. Remember that they are the latest revisions of the Steinmetz books in a handsome specially bound library edition at a price a little less than the regular editions of the books.



McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

You may send me on approval for 10 days' free examination, the STEINMETZ ELECTRICAL ENGINEERING LIBRARY. I agree to return the books, postpaid, in 10 days or to remit $4.00 in 10 days and $4.00 per month for eight months.

Name ....

Address ....

Official Position ....

Name of Company ....

Subscriber to Electric Railway Journal?..........Mem. A.I.E.E.?

(Books sent on approval to retail purchasers in U. S. and Canada onyl.)
E. R. J. 3-1-24

Don't Spend a Dollar on Your Track (Old or New)

Until you get "INDIANAPOLIS"
Prices for Comparison

"Indianapolis" Economy Products Cost Less

Guaranteed to Save Their Entire Cost

Thru Design, Quality, Price and Service

Solid Manganese Crossings
also Frogs, Mates, and Tongue-Switches.
(15 years of specializing has produced a product UNEXCELLED, and LOWEST in COST, quality considered)

Electric Welders
Thoroly EFFICIENT
(Economical and never out of COMMISSION)

Welded Rail Joints
(A COMBINATION OF EVERY ESSENTIAL FACTOR in Rail Joining and Bonding)

Welding Steel Electrodes
Absolutely Dependable

Electric Welding Supplies
Hoods, Lenses, Carbons, Etc.

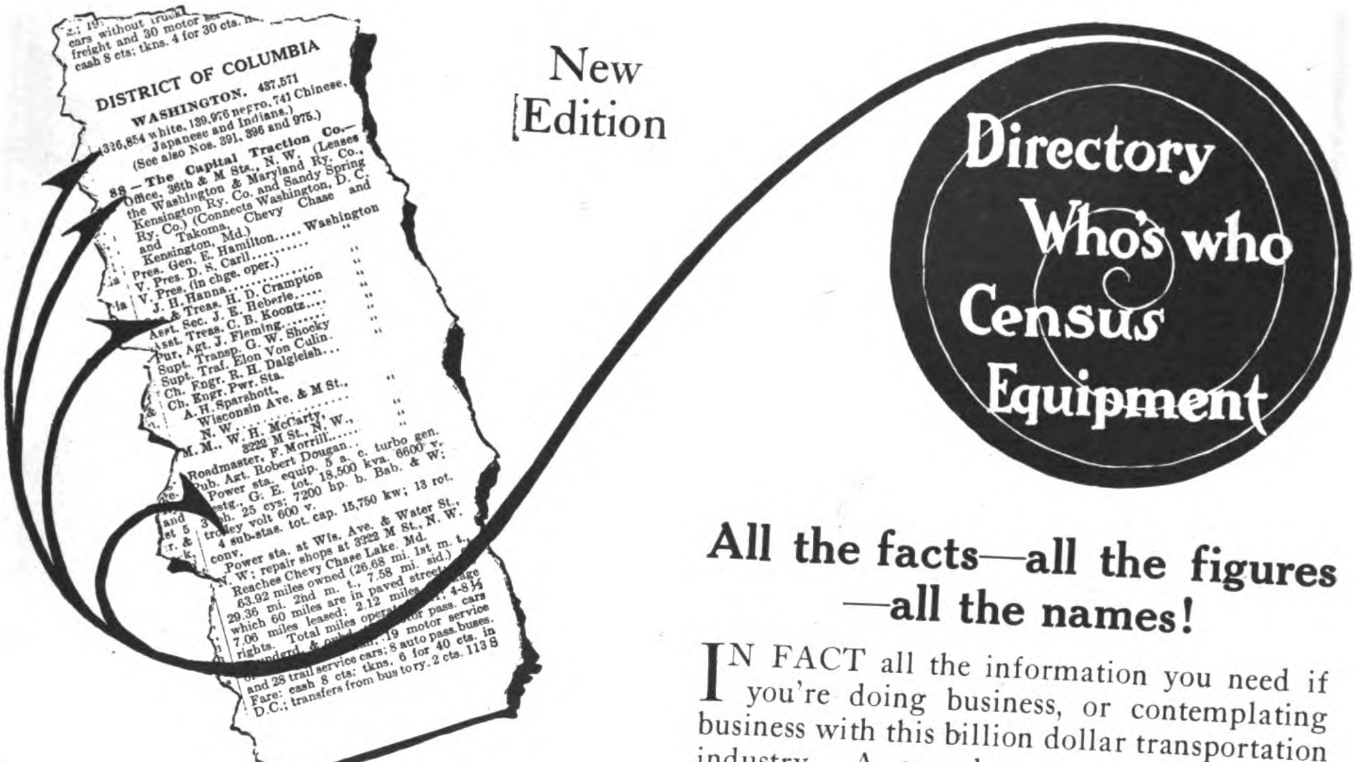
"INDIANAPOLIS"

Is Saving Electric Railways Millions of Dollars Annually

The Indianapolis Switch & Frog Co.
SPRINGFIELD, OHIO

Los Angeles, *San Francisco* *Kansas City* *Boston*

McGRAW ELECTRIC RAILWAY DIRECTORY



.; 19; cars without truck freight and 30 motor ser cash 8 cts; tkns. 4 for 30 cts.

DISTRICT OF COLUMBIA

WASHINGTON. 437,571 (326,854 white, 139,976 negro, 741 Chinese, Japanese and Indians.) (See also Nos. 391, 396 and 975.)

88—The Capital Traction Co.—Office, 36th & M Sts., N. W. (Leases the Washington & Maryland Ry. Co., Kensington Ry. Co. and Sandy Spring Ry. Co.) (Connects Washington, D. C. and Takoma, Chevy Chase and Kensington, Md.)

Pres. Geo. E. Hamilton..... Washington
V. Pres. D. S. Carll.......... "
V. Pres. (in chge. oper.) J. H. Hanna.............. "
& Treas. H. D. Crampton "
Asst. Sec. J. E. Heberle..... "
Asst. Treas. C. B. Koontz.... "
Pur. Agt. J. Fleming........ "
Supt. Transp. G. W. Shocky
Supt. Traf. Elon Von Culin.
Ch. Engr. R. H. Dalgleish...
Ch. Engr. Pwr. Sta. A. H. Sparshott, Wisconsin Ave. & M St., N. W.................. "
M. M., W. H. McCarty, 3222 M St., N. W., "
Roadmaster, F. Morrill...... "
Pub. Agt. Robert Dougan..

Power sta. equip. 5 a. c. turbo gen. estg., G. E. tot. 18,500 kva. 6600 v. 3 ph. 25 cys; 7200 hp. b. Bab. & W; trolley volt 600 v. 4 sub-stas. tot. cap. 15,750 kw; 13 rot. conv.

Power sta. at Wis. Ave. & Water St., N. W; repair shops at 3222 M St., N. W. Reaches Chevy Chase Lake. Md. 63.92 miles owned (26.68 mi. 1st m. t., 29.36 mi. 2nd m. t., 7.58 mi. sid.) of which 60 miles are in paved street. [illegible] 4-8½ 7.06 miles leased; 2.12 miles [illegible] rights. Total miles operat[illegible] [illegible]or pass. cars undgrd. & ovhd. [illegible] 19 motor service and 28 trail service cars; 8 auto pass. buses. Fare: cash 8 cts; tkns. 6 for 40 cts. in D.C.; transfers from bus to ry. 2 cts. 113 S

New
Edition

All the facts—all the figures —all the names!

IN FACT all the information you need if you're doing business, or contemplating business with this billion dollar transportation industry. A complete survey of the field, made through direct contact with every electric railway company in the United States, Canada, Mexico, and the West Indies.

It is estimated that $262,000,000 will be expended for electric railway equipment in 1924. To sales organizations, equipment manufacturers, engineers, and others interested in this huge industry, the McGraw Electric Railway Directory is invaluable.

Leading Features

1—**Complete list of every recorded electric railway company in the United States, Canada, Mexico, and the West Indies.**
2—**List and addresses of officials, superintendents, department heads and purchasing agents, corrected to date of issue.**
3—Addresses of repair shops.
4—Addresses of power plants and list of equipment.
5—Lists of sub-station equipment.
6—Transmission and trolley voltage.
7—Whether doing a light and power business.
8—Mileage of track.
9—Number and kinds of cars used.
10—Number of motor buses used.
11—Amusement parks owned or reached.
12—Rates of fare.

Published annually
Price $7.50
Order now

E.
R.
J.
I.

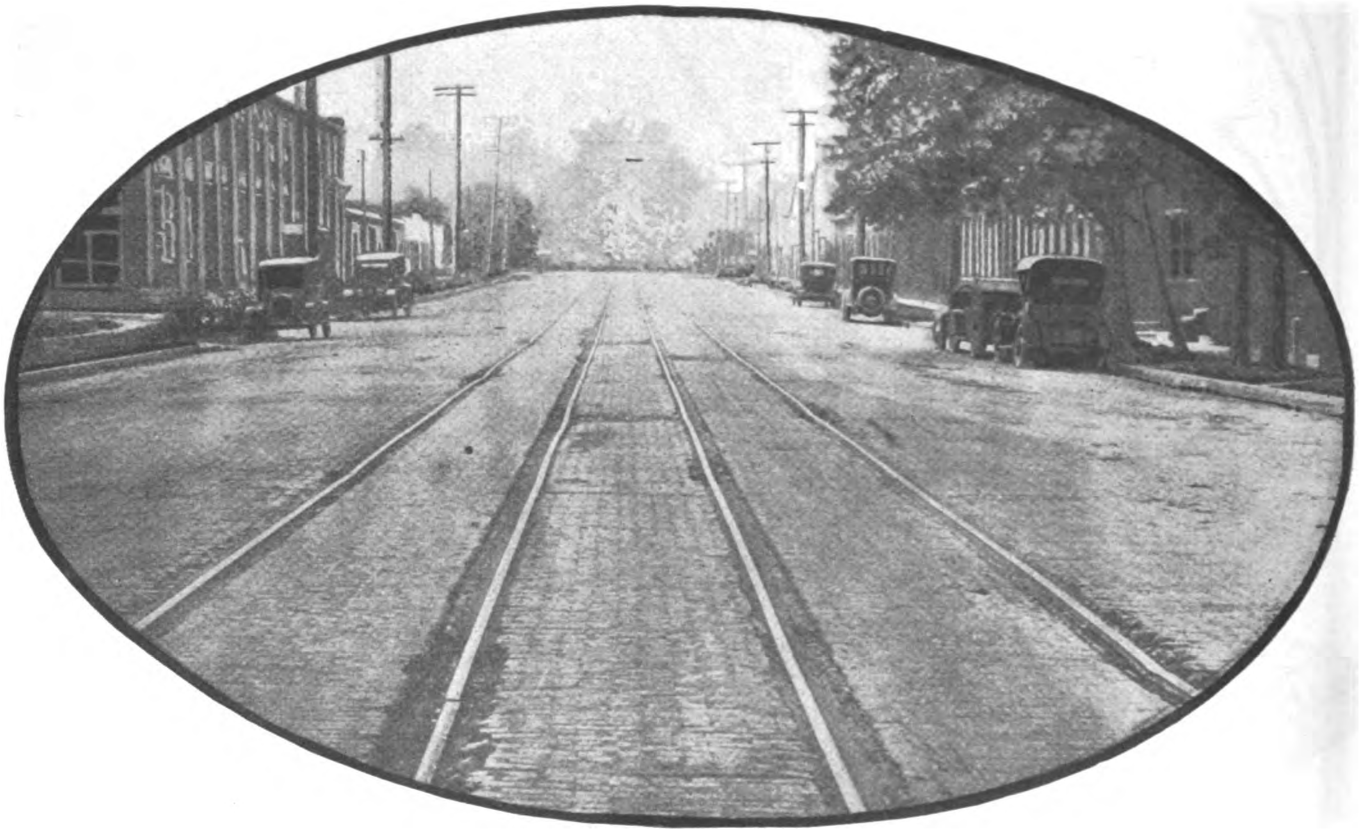
**Directory Department,
Electric Railway Journal
10th Ave. and 36th St.,
New York, N. Y.**

Gentlemen: — Will you please send me:—

......copies of New McGraw Electric Railway Directory,
or
......further information about the McGraw Electric Railway Directory.
(Check one)

Name ....
Street ....
City .... State...........

All Bad Lead



There isn't a car in sight!
Why?
They are in the car barns, for repairs.
What sent them there?
Bad track conditions.

DAYTON

d *Tracks*

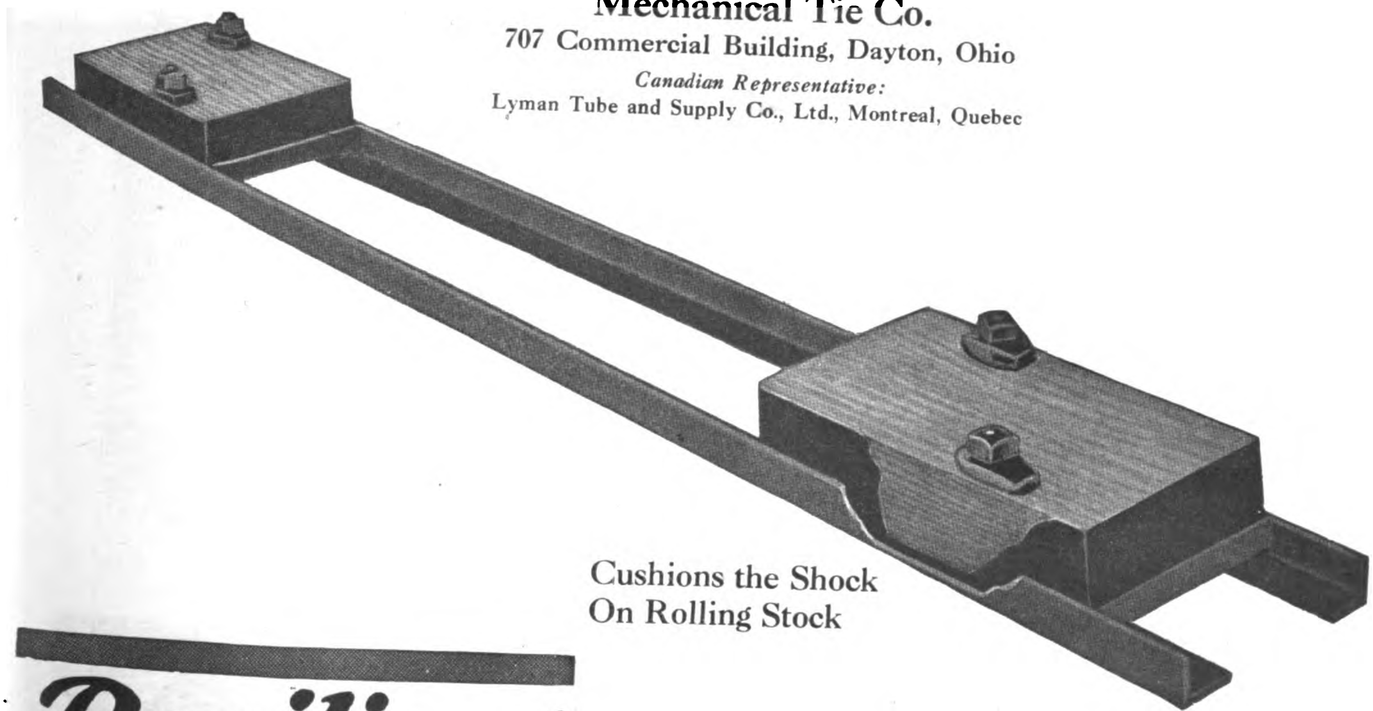
d to the Car Barn

THEY have to—because the cars using such tracks are constantly in need of repair. The only way to overcome this costly condition is to build efficient track—that is to say—RESILIENT track.

Resilient track, built with Dayton Resilient Ties imbedded in concrete, absorbs the shock on rolling stock and reduces upkeep to a minimum. The resilient feature of the Dayton Tie also prevents the shock of traffic from reaching the concrete foundation. In other words, the Dayton Resilient Tie saves both the rolling stock and the track.

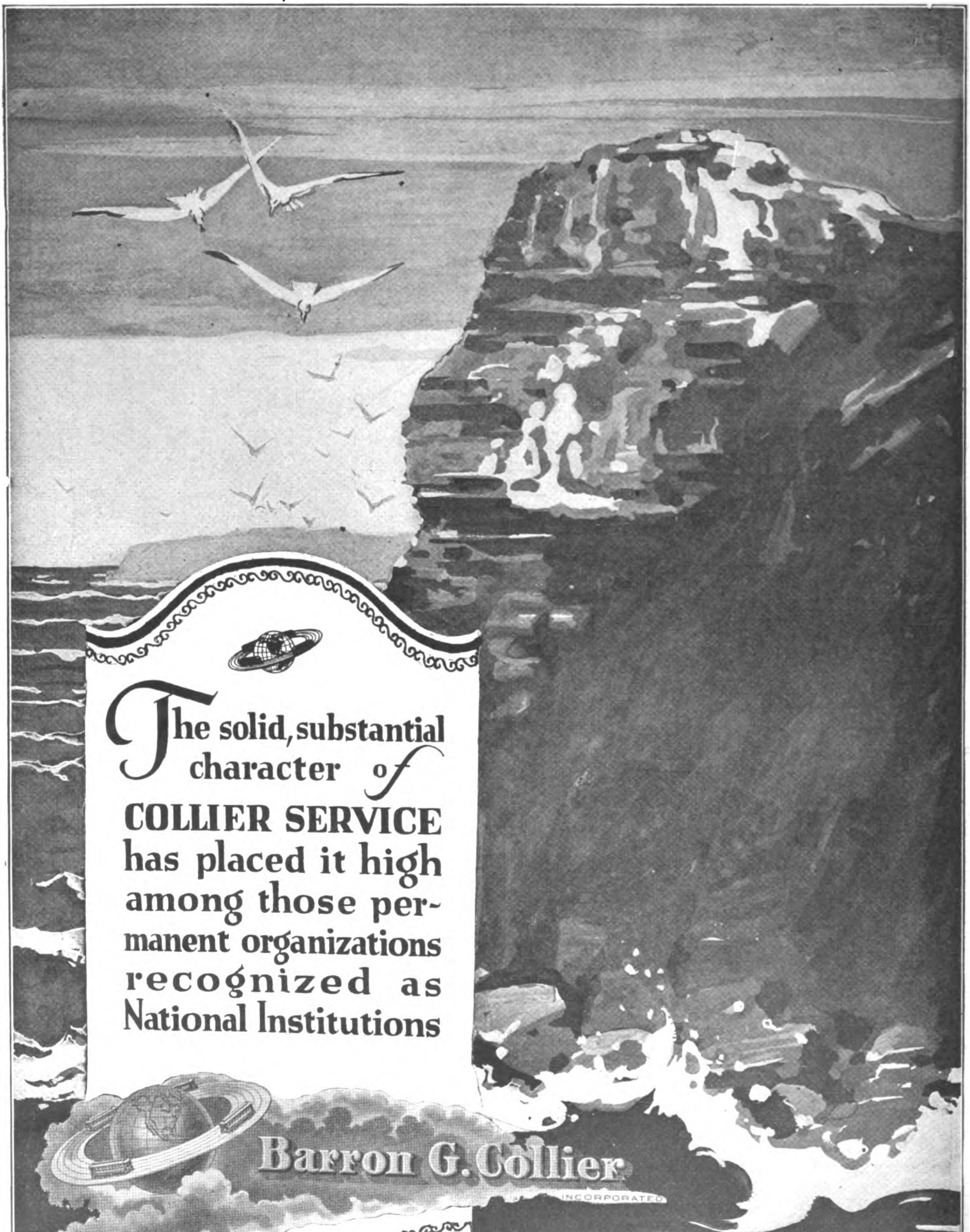
Get all the facts about Dayton Resilient Ties.

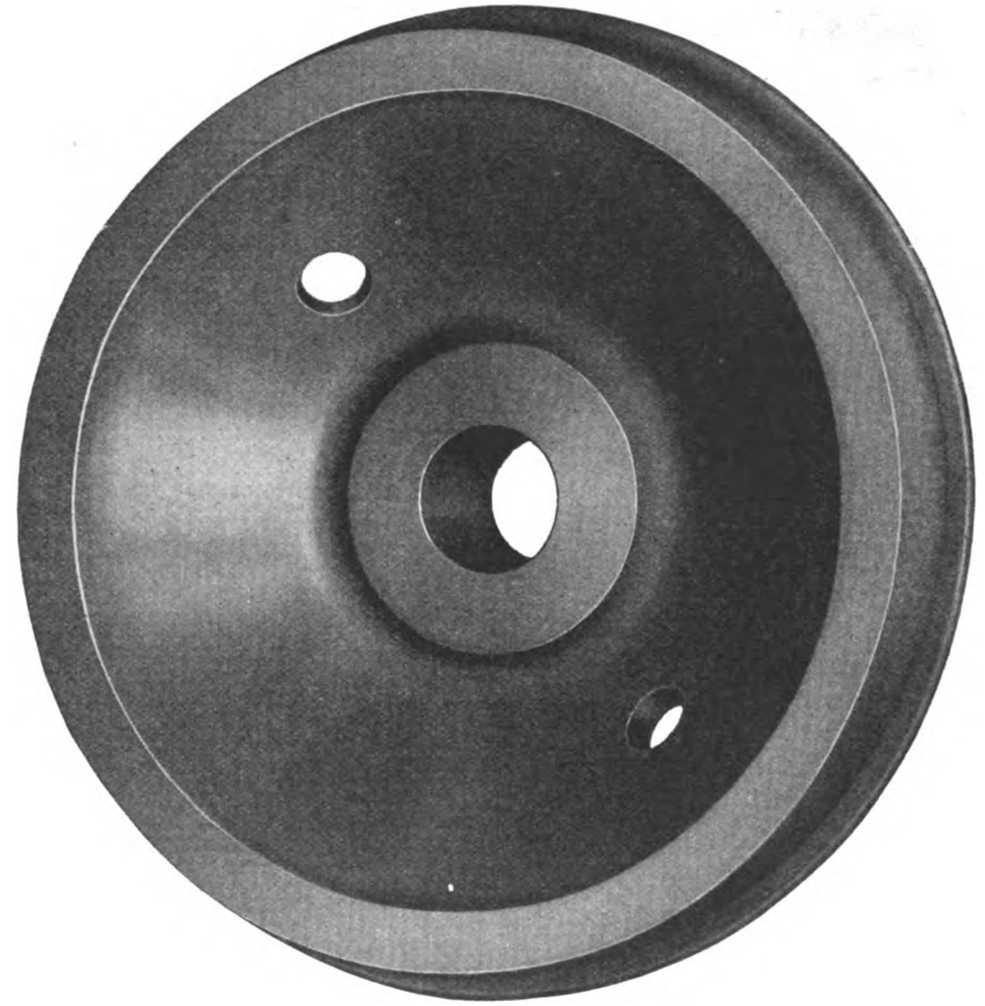
The Dayton
Mechanical Tie Co.
707 Commercial Building, Dayton, Ohio
Canadian Representative:
Lyman Tube and Supply Co., Ltd., Montreal, Quebec



Cushions the Shock
On Rolling Stock

Resilient
TIE


The solid, substantial character of
COLLIER SERVICE
has placed it high among those permanent organizations recognized as National Institutions
Barron G. Collier
INCORPORATED



Cambria Car Wheels and Axles
for Electric Railway Service

Rolled Steel Wheels and Axles for electric railway service have long been manufactured at the Cambria Works of Bethlehem Steel Company and are well-known throughout the field for their uniformity of material and superior workmanship.

From the raw materials entering into the production of pig iron, through the various stages of steel manufacture, great care is taken in the selection of proper grades of material, and with the use of modern equipment, axles and wheels undergo exceptional refinement in structure.

Bethlehem manufactures many other products for the electric railway field. A partial list includes rails, trackwork, splice bars, bolts, spikes, tie plates, tie rods, and pole line materia..

Use Bethlehem Selflock Bolts on all Electric Railway Equipment where you require bolts with tight nuts — nuts that will stay where they are placed.

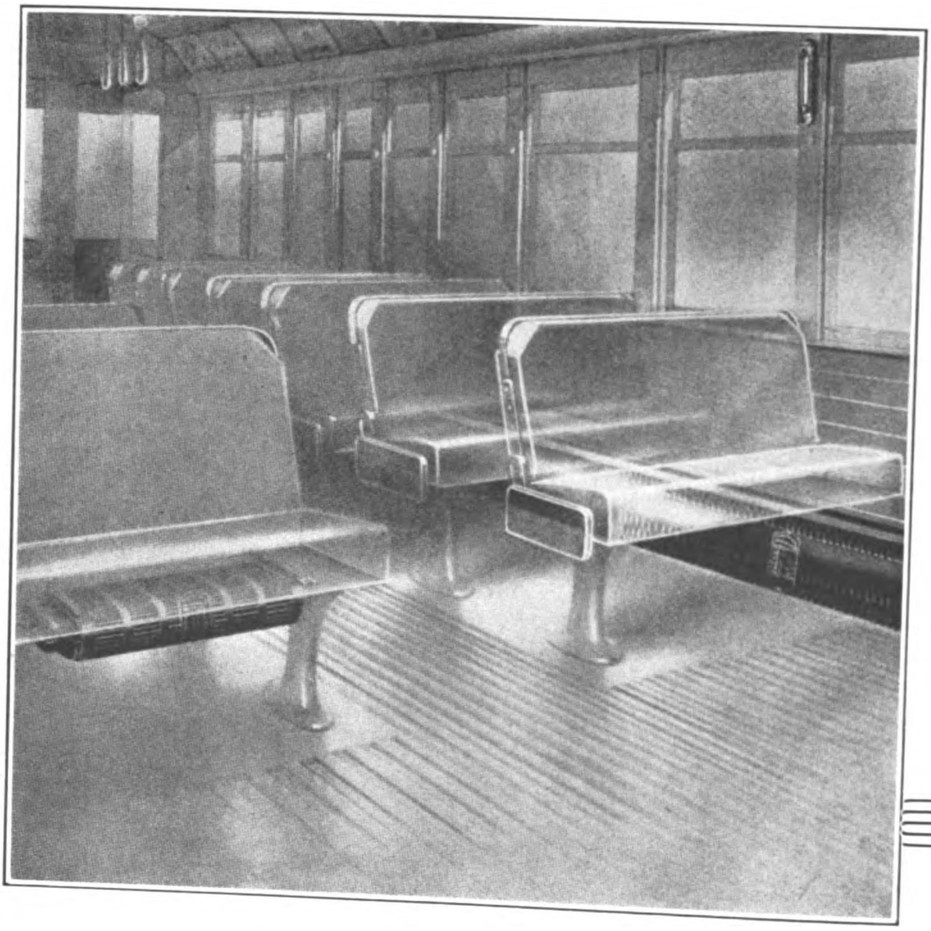
BETHLEHEM STEEL COMPANY, ***General Offices:*** **BETHLEHEM, PA.**

Sales Offices:

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Detroit Cincinnati Chicago St. Louis San Francisco

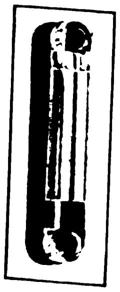
Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM



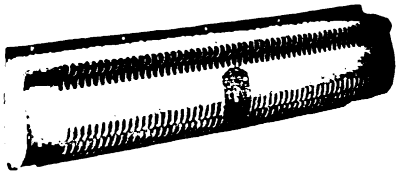
CONSOLIDATED

Electric Car Heaters
Thermostatic
Control



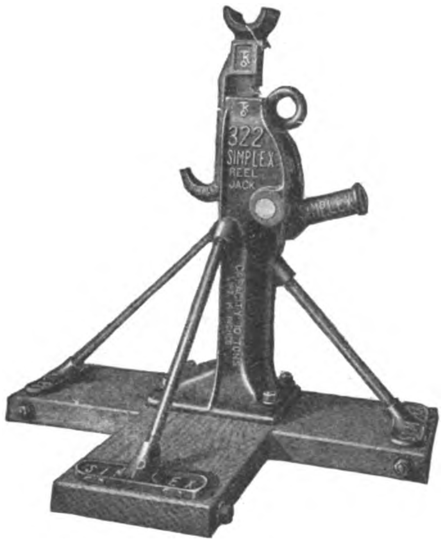
Single and double coil cross seat, truss plank, and panel type heaters for railway service. Consolidated Heaters with Consolidated Thermostatic Control a combination which means efficient operation and economy in maintenance.

Consolidated Car Heating Co.
New York Albany Chicago



"Jack 'em out" **SIMPLEX** "Jack 'em out"

Simplex Reel Jacks Have a "T" Base Do *Yours?*



JACKS

Simplex Cable Reel Jacks

Meet Every Requirement of Service, Capacity, Safety and Economy

No. 322—Simplex Jacks for cable pulling cannot tip over from an accidental side pull. They have a "T" shaped base rigidly braced with steel rods.

They are designed for Reels of 36 in. to 84 in. diameter. The raise on the Cap is 29 in. to 43 in.; on the Shoe from 17 in. to 31 in.

The manpower available in this automatic double-acting jack can raise a reel 3 in. in 17 seconds by the watch. ¼-in. lifts per upward and downward stroke practically level the Reel even on uneven ground.

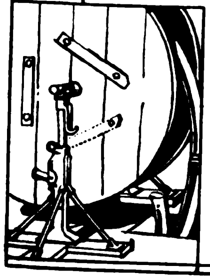
Simplex Jacks No. 322 are furnished in Rights and Lefts, a safety feature and one that saves time and the money it represents.

JACKS

Distributed by

Western Electric Company

Offices in 47 Cities



Manufactured by

Templeton, Kenly & Co., Limited

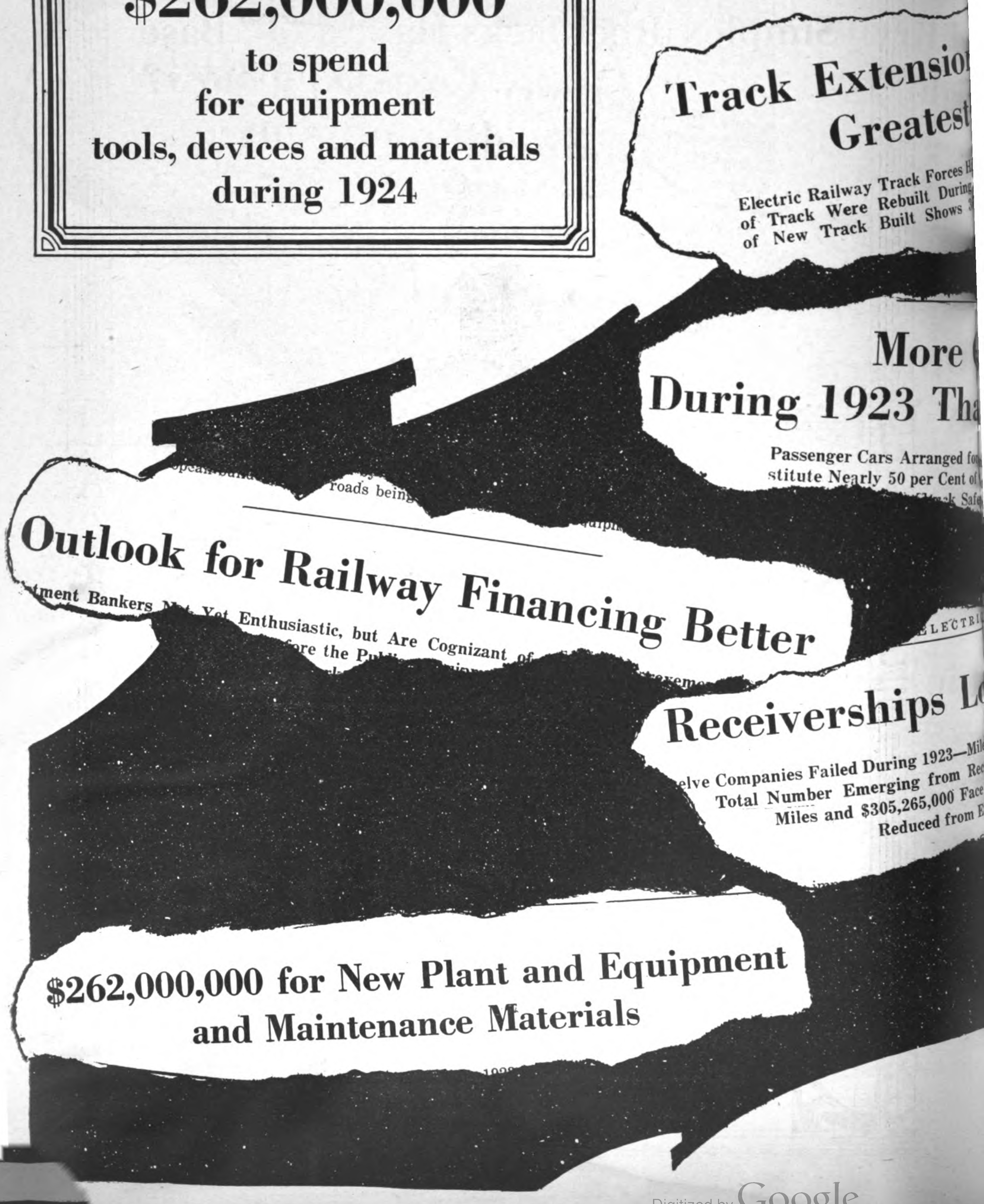
Established 1899 Sole Manufacturers

Chicago Ill. U.S.A.

Electric Railways have

$262,000,000

to spend
for equipment
tools, devices and materials
during 1924



Track Extensio
Greatest

Electric Railway Track Forces H
of Track Were Rebuilt During
of New Track Built Shows 3

More
During 1923 Tha

Passenger Cars Arranged fo
stitute Nearly 50 per Cent of

roads being

Outlook for Railway Financing Better

tment Bankers Not Yet Enthusiastic, but Are Cognizant of

Receiverships Lo

elve Companies Failed During 1923—Mil
Total Number Emerging from Rec
Miles and $305,265,000 Face
Reduced from E

$262,000,000 for New Plant and Equipment
and Maintenance Materials

xten
reat
d Reconstruction
ight Years

y Track
e Rebuil
k Built
usy with Reconstruction and More Miles
Year than Ever Before—The Amount
Over 1922 and 100 Miles Over 1921

ailway Costs Approaching
abilized Conditions

that Period of Rapid Fluctuations of Labor and Material Prices Is A
holesale Prices of Commodities and Street Railway Operating Materials Costs Rece
ing 1923, While Construction Costs and Street Railway Wages H

t the country is

Mo Ordered
23 ny Year Since 1913

e-Man or Two-Man Operation Con-
f New Cars for City Service—Th
rdered Fell Off 60 per Cen

AY JOURNAL

st in Thirteen Years

ack Involved and Capitalization Lowest on Reco
or Foreclosure Is Thirty-one, Lifting 1,77
Securities Involved—Net Re
to Sixty-three Compan

ELECTRIC RA

Orders for Automotive Equipment on the Increase

PURCHASES of motor buses by electric railway
more than doubled during 1923 as compared wi
the preceding year, a as also a healthy
the nu trucks ordered

1924—A great year for Electric railways

It's a market that needs equipment—machinery—trackwork—line material—shop supplies; more than 4,000 commodities in greater quantities than ever before.

Electric railway men will look for the latest methods, tools and practice in maintenance work in the

Annual Maintenance Number

(dated March 22, 1924)

Send your reservation for adequate representation now. We still have time to prepare effective advertising copy.

ELECTRIC RAILWAY JOURNAL, Tenth Ave. at 36th St., New York City

The McARTHUR TURNBUCKLE

Better and Boyerized

Requires only a small hand wrench to get a grip that "stays put." One full tooth exposed at the end on each section acts as a cutter in removing ice or caked mud.

"Like water off a duck's back!"

All the jarring and grinding of sudden stops—the hardest knocks of brake service on city cars!

They make no more impression on the glass-hard, armor-plate, surface of BOYERIZED parts than water does on a duck's back. Again we say that Boyerized parts outlast ordinary case-hardened steel three to four times—and we mean just that, they do! The cost, though, is only slightly higher. Think it over!

Buy from this list of long life parts THEY'RE BOYERIZED

- **Brake Pins**
- **Brake Hangers**
- **Brake Levers**
- **Pedestal Gibs**
- **Brake Fulcrum**
- **Center Bearings**
- **Side Bearing**
- **Spring Post Bushings**
- **Spring Posts**
- **Bolster and Transom Chafing Plates**
- **McArthur Turnbuckles**
- **Manganese Brake Heads**
- **Manganese Truck Parts**
- **Bushings**
- **Bronze Bearings**

Let us quote on your requirements

Bemis Car Truck Company
Electric Railway Supplies
SPRINGFIELD, MASS.

Representatives:
Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.

The COLUMBIA Catalog

To Keep Equipment in Condition

means to repair or replace all parts as soon as there is any possibility that they may cause you trouble.

The Columbia Machine Works has special facilities for making repairs—extending even to the complete rebuilding of certain car types—while our standard railway parts are of the highest quality and can be furnished on the shortest notice.

Watch this space for reprints of the pages that are being constantly added to the Columbia parts catalog. Be sure you have the catalog itself in your possession.

We are also preparing a series of special bulletins dealing with Columbia Bearings, Gear Cases, Coils, Brush Holders, Line Ears, Trolley Wheels and Trolley Poles. Be sure your name is on our list to receive this series in full.

COLUMBIA 1892 MACHINE WORKS

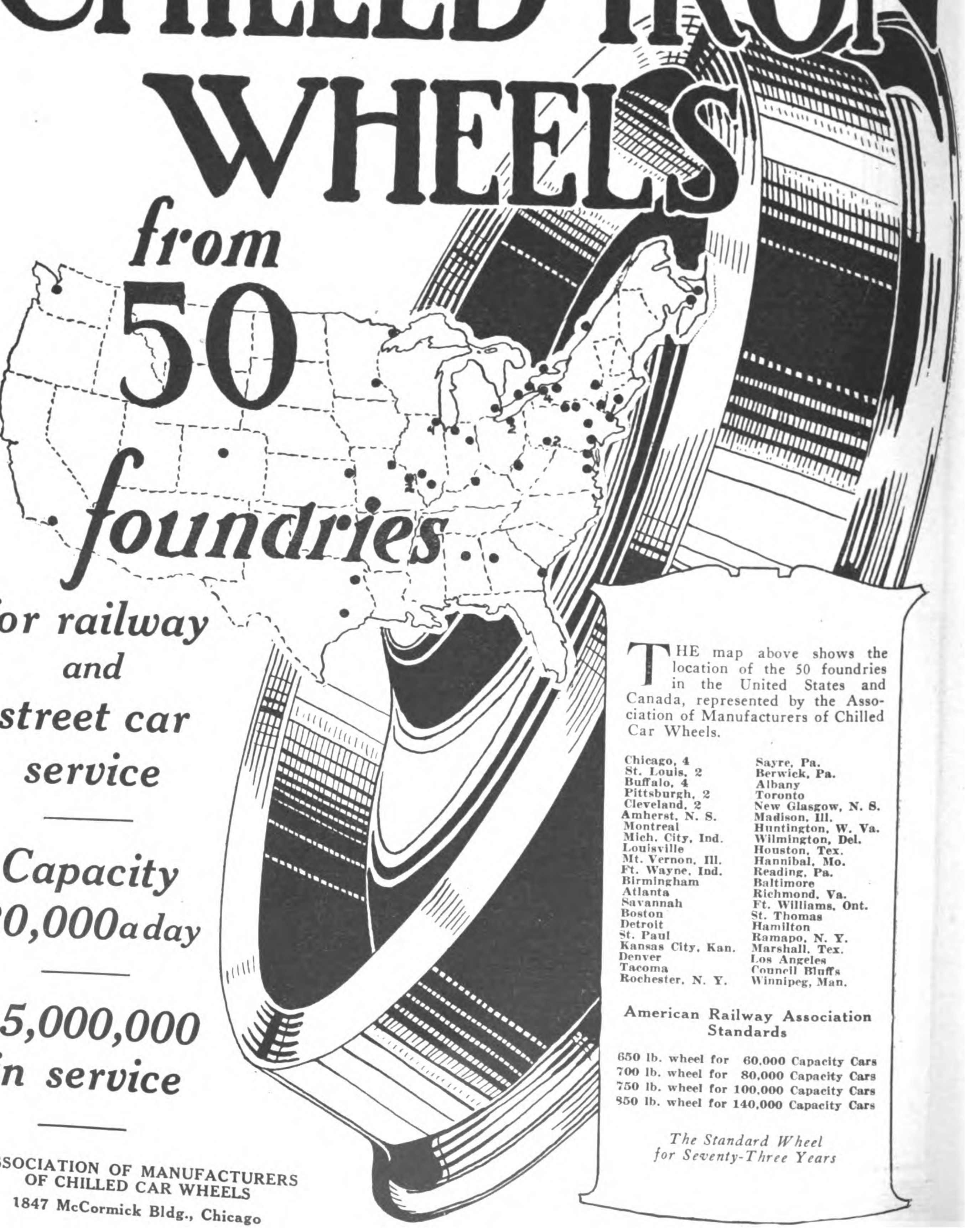
3313 ATLANTIC AVE., BROOKLYN N. Y.

CHILLED IRON WHEELS

from

50

foundries



for railway
and
street car
service

Capacity
20,000 a day

25,000,000
in service

ASSOCIATION OF MANUFACTURERS
OF CHILLED CAR WHEELS
1847 McCormick Bldg., Chicago

THE map above shows the location of the 50 foundries in the United States and Canada, represented by the Association of Manufacturers of Chilled Car Wheels.

Chicago, 4
St. Louis, 2
Buffalo, 4
Pittsburgh, 2
Cleveland, 2
Amherst, N. S.
Montreal
Mich. City, Ind.
Louisville
Mt. Vernon, Ill.
Ft. Wayne, Ind.
Birmingham
Atlanta
Savannah
Boston
Detroit
St. Paul
Kansas City, Kan.
Denver
Tacoma
Rochester, N. Y.
Sayre, Pa.
Berwick, Pa.
Albany
Toronto
New Glasgow, N. S.
Madison, Ill.
Huntington, W. Va.
Wilmington, Del.
Houston, Tex.
Hannibal, Mo.
Reading, Pa.
Baltimore
Richmond, Va.
Ft. Williams, Ont.
St. Thomas
Hamilton
Ramapo, N. Y.
Marshall, Tex.
Los Angeles
Council Bluffs
Winnipeg, Man.

American Railway Association Standards

650 lb. wheel for 60,000 Capacity Cars
700 lb. wheel for 80,000 Capacity Cars
750 lb. wheel for 100,000 Capacity Cars
850 lb. wheel for 140,000 Capacity Cars

The Standard Wheel for Seventy-Three Years

Safeguard Your Highway Crossings With NACHOD SIGNALS

RAIL ROAD
CROSSING

One of the 13 Nachod Crossing Signals on the line of the Interstate Public Service Company, Indianapolis, Indiana.

They give an arrestive warning at the highway against the approach of your interurban trains by loud ringing bell and flashing red lights. Before he reaches the crossing they give the motorman a special indication that he has started the bell ringing. Made also with swinging wig-wag. Operated entirely from trolley power, and at the highest possible car speeds. Their cost is but little—and by their insistent warning they save damage suits and expensive litigation.

Install Nachod Highway Crossing Signals and sleep sounder o'nights. Get your copy of Catalog 720 telling all about them.

Remember Nachod Spells Safety!

Nachod Signal Company, Inc.
4777 Louisville Ave., Louisville, Ky.

Also manufacturers of Block Signals, Automatic Headway Recorders.

Type ET
Brazed Bond

BRAZED BONDS

ARC WELD BONDS

Type AT-F
Arc Weld Bond

Conserve your power

A poor track return permits your electric power to heat up rail joints. There is a large monetary loss due directly to the power so wasted and a larger loss due to the insufficiency of the remaining power to properly propel your cars—evident in slower schedules and higher operating costs.

Plan now to bring your track return to maximum efficiency, and as you plan bear in mind that ERICO Brazed or Arc Weld Rail Bonds excel in permanent conductivity and low cost of installation. The application of ERICO bonds is a paying investment. Let us demonstrate.

Write today to

THE ELECTRIC RAILWAY IMPROVEMENT CO.
Main Office and Works: 2070 East 61st Place, Cleveland, Ohio

Who made the first successful

moulded insulation for Line Material? It was Anderson.

And the same type of insulation that has stood the test for over thirty years is used to make these

Feed-Wire Insulators

Of Aetna throughout, they are designed to withstand the severest climatic conditions and the hardest usage—to help you keep down maintenance costs.

Feeder wire, in the type of insulator shown, may be tied either to the top or side.

Split Spool Insulators

Also of Aetna insulation. Used for holding cable where pins cannot be used or for supporting wire or cable of any kind.

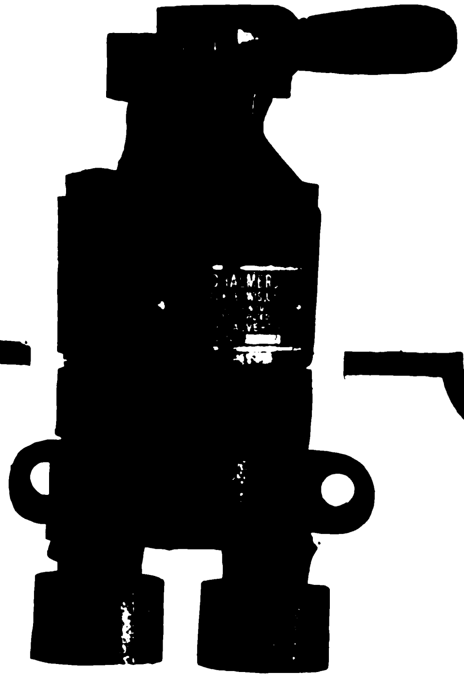
Made in fourteen different sizes of hole from 13/32-in. to 2¾-in.

Anderson Feeder Wire and Split Spool Insulators will give you the greatest measure of dependability and service.

Write for prices.

Albert & J. M. Anderson Mfg. Co.
289-305 A Street, Boston, Mass.

Offices:
New York, 135 Broadway
Philadelphia, Broad and Chestnut Sts.
Chicago, 105 So. Dearborn Street.
London, 12 Moor Lane, E. C. 2.



ALLIS-CHALMERS

Type "C"

Engineers Valves for Air Brakes

This engineer's valve has been adopted by many important railways as STANDARD, regardless of the other equipment used. Several years of commercial application has demonstrated type "C" Engineer's Valve to be superior in every respect. A few important features are graduated application positively secured at service point—quick emergency point—graduated release, if desired—very quick release at full release point—no ground joints—simple design—valve can be completely dismantled and reassembled in two minutes by removing only two nuts—etc., etc.

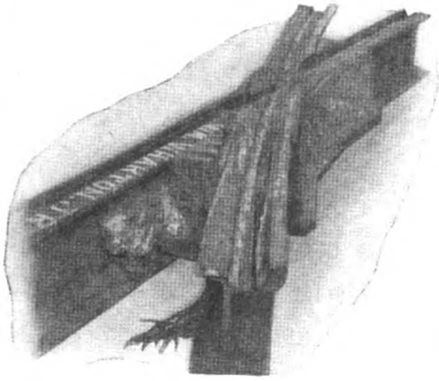
500,000 service applications and releases at 90 lbs. pressure show no wear on the parts.

Send for Bulletin No. 1103A.

ALLIS-CHALMERS
MANUFACTURING COMPANY
MILWAUKEE, WISCONSIN. U.S.A.

TAYLOR-WHARTON IRON & STEEL CO.

TIOGA STEEL & IRON CO. | WM WHARTON Jr. & CO. INC. | PHILADELPHIA ROLL & MACH CO.



In Eight Years and Nine Months Nearly Three Million Double-truck Cars Passed Over This Tisco Manganese Steel Centre Frog

The marvelous wear-resisting qualities of Tisco Manganese Steel Centre Frogs are well demonstrated in this type "K.C.," over which passed 2,865,000 double-truck cars in eight years and nine months. The unusual serviceability of Tisco Manganese steel trackwork has been a big factor in keeping down maintenance costs.

Our engineering staff, working with the foremost railway engineers, has developed various types of trackwork unsurpassed for long service. *We would be glad to recommend the type most suitable for your purposes.*

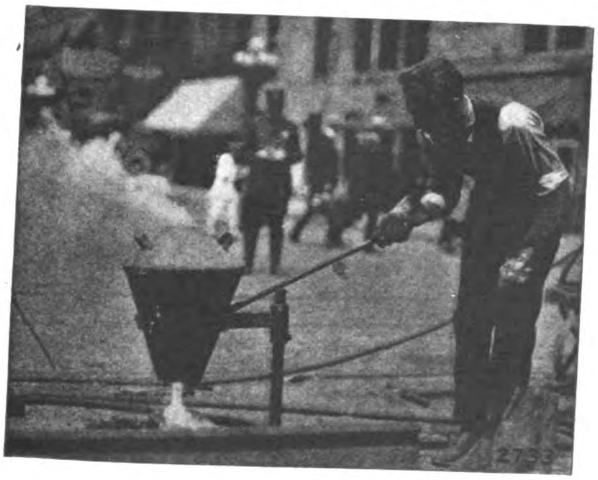
Wm. Wharton Jr. & Co., Inc.
Easton, Pa.

Taylor-Wharton Iron & Steel Co.
Plant at High Bridge, N. J.
Manganese Steel Wearing Parts

Wm. Wharton Jr. & Co.
Plant at Easton, Pa.
Special Trackwork Cylinders for Gases

Tioga Steel & Iron Co.
Plant at Philadelphia, Pa.
Hammered and Pressed Forgings

Phila. Roll & Machine Co.
Plant at Philadelphia, Pa.
Rolls and Rolling Mill Machinery



The THERMIT INSERT RAIL WELD

"We are satisfied that this is the only commercially practicable method of eliminating the joint"

San Antonio Public Service Co.

A clear cut opinion of the Thermit Insert Rail Weld, based, not on a hasty decision, nor on isolated experiments, but on practical experience with Thermit welds dating from 1913. Incidentally, the first welds made on this property are still in good condition today.

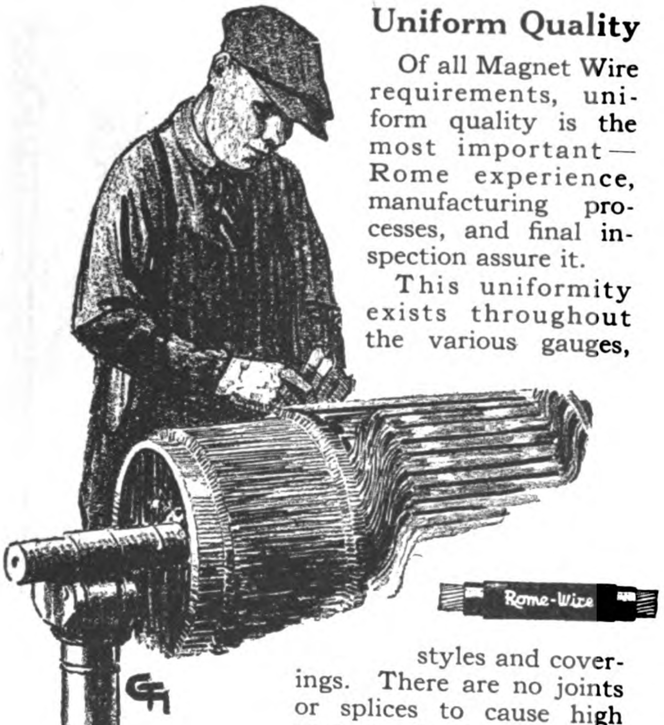
And such a record is by no means unusual. The Thermit Insert Rail Weld has long passed the experimental stage. It eliminates the rail joint entirely, with all attendant bonding, bolts, and fishplates. Electrical conductivity is fully equal to that of the unbroken rail; while if anything the joint is merchanically stronger. Add to this the fact that Thermit Welds cost little, if any, more than less permanent methods.

Let us discuss Thermit Welding as applicable to your trackwork. An exhaustive new booklet No. 1532, on Thermit Rail Welding, will be sent on request. Write for it now.

Metal & Thermit Corporation
120 Broadway, New York
PITTSBURGH CHICAGO BOSTON S. SAN FRANCISCO TORONTO

ROME WIRE

ROME Magnet Wire



Uniform Quality

Of all Magnet Wire requirements, uniform quality is the most important—Rome experience, manufacturing processes, and final inspection assure it.

This uniformity exists throughout the various gauges, styles and coverings. There are no joints or splices to cause high spots or give trouble.

Rome Magnet Wire uniformity is proved by the way it works on the job, on both new and repair work, in application and in service.

ROME

Magnet Wire

Supplied in all B. & S. gauges; round in single and double cotton or silk covered, enamel covered, enamel and silk or cotton covered; square in double cotton covered; rectangular in enamel or single or double cotton covered. All of uniform quality and on hand for prompt shipment.

Write Dept. B 2

ROME WIRE COMPANY

Mills and Executive Office:
ROME, N. Y.

Atlantic Mills
STAMFORD, CONN.

Diamond Mills
BUFFALO, N. Y.

DISTRICT SALES OFFICES:

NEW YORK
50 Church Street

DETROIT
25 Parsons St.

BOSTON
Little Building

CHICAGO
14 E. Jackson Blvd.

LOS ANGELES
J. G. Pomeroy
336 Azusa St.

WIRE=ROME

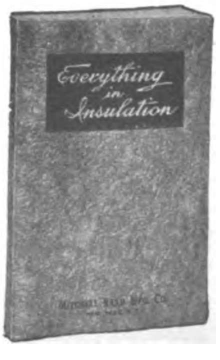
Everything in Insulation
COIL INSULATION
TAPE, CLOTH, PAPER, MICA, VARNISH, TWINE, ETC.

The total cost of insulation for a motor is so small that price difference is of little consideration when quality is the desideratum. Untimely breakdown can be more frequently ascribed to poor insulation than to careless workmanship. Tested materials guarantee durability.

MITCHELL-RAND

"Everything in Insulation"

The insulating materials that we sell as factory representatives, at no advance over mill prices, must first pass the same tests for efficiency and durability that we apply to the products of our own make.



This handbook contains 160 pages of helpful information. Among the data presented are: Insulating Compounds and Waxes; Common and Approved Test Methods; Dielectric Strength of Varnished and Other Materials; Insulating Varnishes and How to Use Them; etc., etc. Sent free of charge.

Mitchell-Rand Mfg. Co.
18 Vesey St., New York, N. Y.

DIXON'S Silica-Graphite PAINT

is immune from attacks by acids, alkalies, gases and fumes. Impervious to water and not affected by heat or cold. It dries into a smooth elastic surface and lasts for long periods of time because of the pigment, flake silica-graphite and the vehicle, pure boiled linseed oil.

Dixon's is a paint in which the flake graphite and silica are *naturally* and not artificially combined, and this feature is essential to long life, efficient surface protection, elasticity and resistance to dampness.

Write for Booklet No. 180B.

JOSEPH DIXON CRUCIBLE COMPANY
Jersey City, New Jersey
Established 1827

TRADE
D X N
MARK

DIXON'S
SILICA-GRAPHITE
PAI
DIXON'S
GRAPHITE PAINT
IXON'S
HITE PAINT
ATURAL COLOR
DIXON'S
SILICA-GRAPHITE
PAINT
RED COLOR
JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY
N.J.U.S.A.

DIXON'S Silica-Graphite PAINT

Our H. B. Life Guard

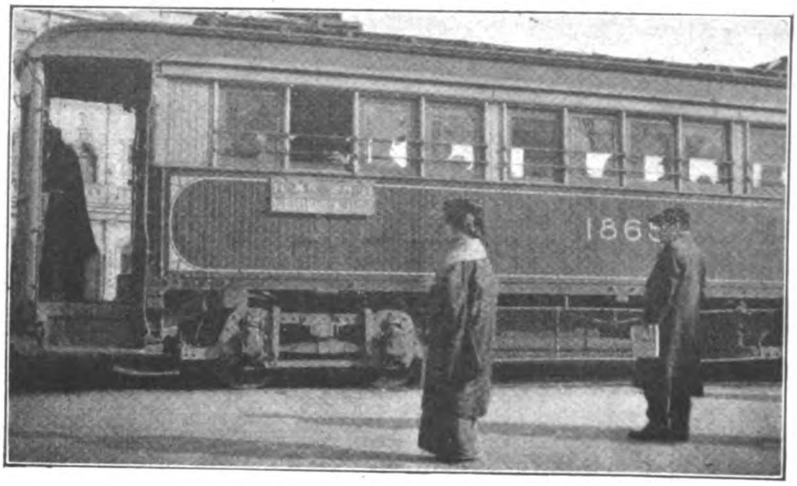
Has Met the Test and Made Good!

Get the H. B. Guard with a real record of efficiency by writing this definite wording in your specifications—

"H. B. Life Guards
To Be Manufactured By
The Consolidated Car Fender Company"

WENDELL & MAC DUFFIE COMPANY
General Sales Agents
110 East 42nd St., New York, N. Y.

Baldwin Electric Motor Trucks in Japan



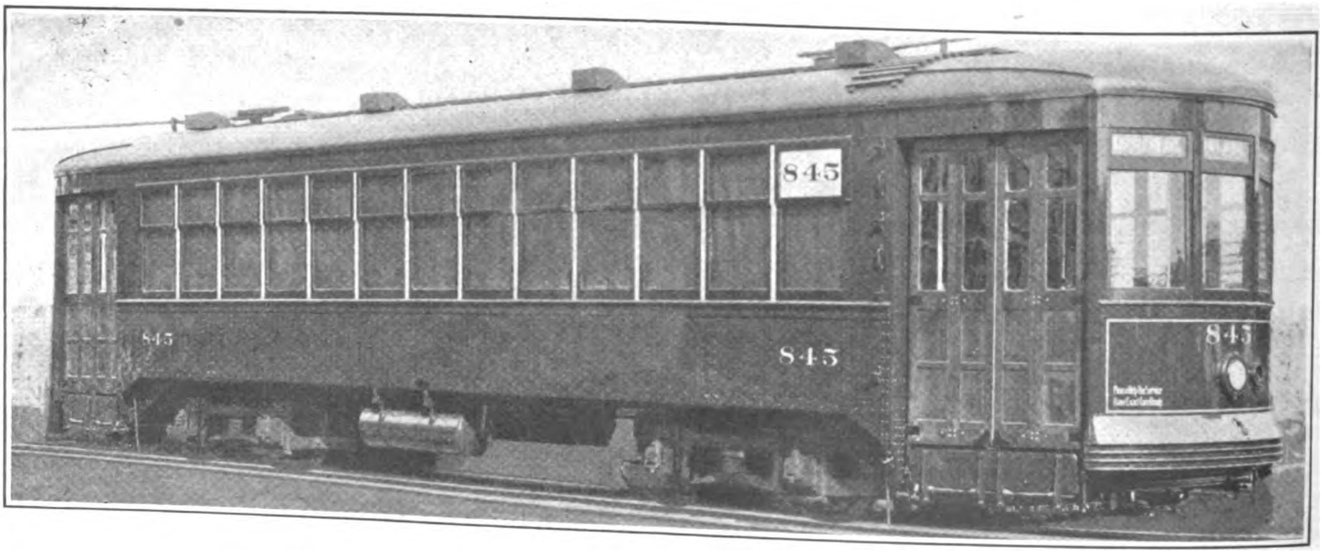
The illustration shows a car in the city service equipped with Baldwin Class "L" Electric Motor Trucks. Where two-motor equipment is used, this truck is very satisfactory. The motors are outside hung, thus permitting of a short wheel base.

Cars equipped with these trucks may be readily repaired in railway shops.

Among the features of this truck are simplicity in construction, economy in current used and low cost of maintenance.

Speed in construction and delivery is a feature of Baldwin Service.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA, U. S. A.
Cable Address, "Baldwin, Philadelphia"



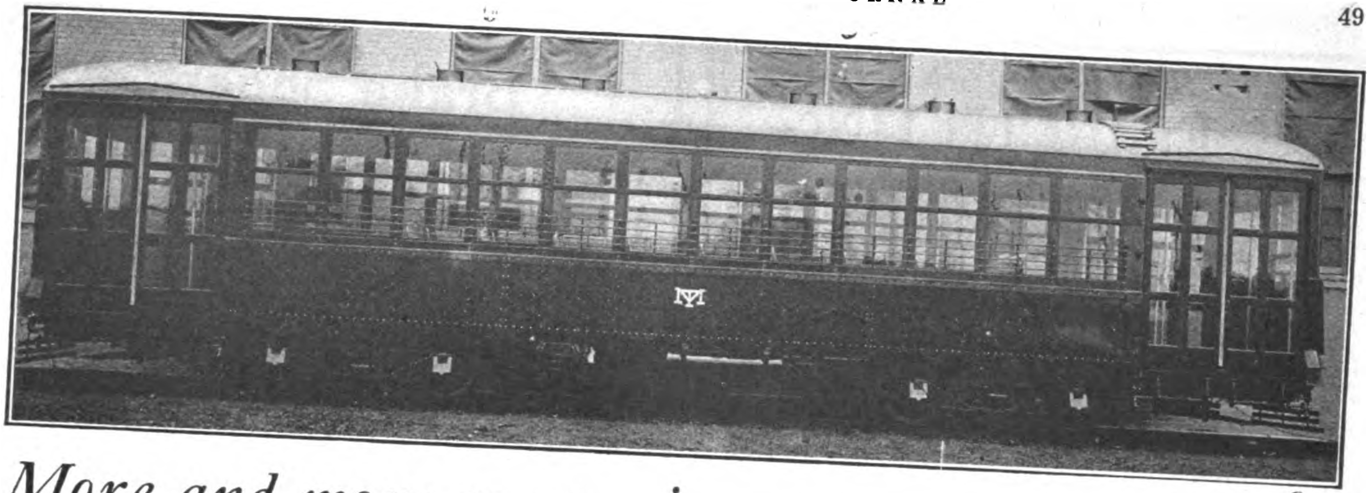
More New Cars from the

PERLEY A. THOMAS CAR WORKS
High Point, N. C.

These new cars are now being put into service by the New Orleans Public Service, Inc.

The features of Perley A. Thomas cars—namely superior grade of materials, careful workmanship, attention to detail, promptness of delivery, and fair prices,—these are reasons why so many new cars are being ordered here.

"We satisfy"—try us!



More and more companies want—

UNIVERSAL SAFETY CARS

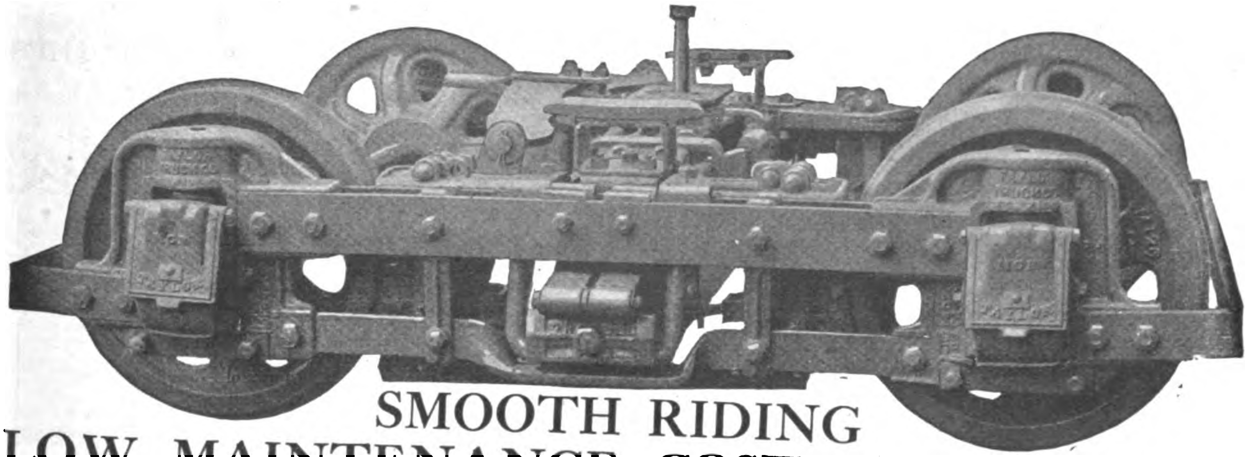
Its high capacity (54 seats)—light weight (15 tons)—and one- or two-man operating arrangements have made it the outstanding recent advance in electric railway car design. Instant popularity has been its achievement. Can you use such a car?

Of course they are "QUALITY" CARS

Write for specifications

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"

R. H.
TAYLOR REDUCED HEIGHT TRUCK
S. WITH A.
TAYLOR STRAIGHT ACTION BRAKE



SMOOTH RIDING

LOW MAINTENANCE COST—Absolute Safety

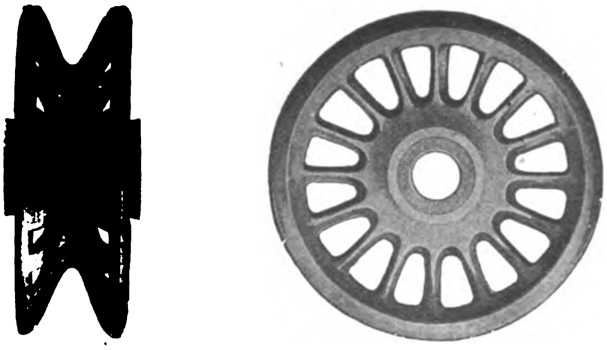
Center Plate Height 22¾ in. with 26 in. Diam. Wheels

For Modern Low Level Double Truck Cars, the Taylor R. H. Truck, equipped with Taylor S. A. Brake, with large diameter hard steel pins, will provide the best possible service results from every standpoint.

TAYLOR ELECTRIC TRUCK CO., TROY, N. Y.

SPECIFICATIONS ON REQUEST · Established 1892 · SEND FOR PORTFOLIO

SLEET CUTTING DEVICES



Nuttall Sleet Wheels replace the standard trolley wheels and efficiently clean sleet coated wires.

Nuttall Sleet Scrapers hook over the trolley wheel—can be attached instantly, and clean the wire thoroughly. Don't wait for a sleet storm—order *today*.

R.D. NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

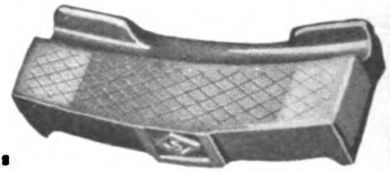
All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

Brake Shoes
A.E.R.A. Standards

Diamond "S" Steel Back is the Best Type

Standard Patterns for

SAFETY CAR



D-67 for Narrow Treads
D-87 for Wide Treads

American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

You're having brush trouble

CORRECT IT
USE LE CARBONE CARBON BRUSHES

They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto

ELRECO TUBULAR POLES

THE "WIRE LOCK" THE CHAMFERED JOINT

COMBINE

Lowest Cost
Least Maintenance
Lightest Weight
Greatest Adaptability

Catalog complete with engineering data sent on request

ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
New York City, 30 Church Street

The Baker
Wood Preserving Company
CREOSOTERS
Washington Court House, Ohio

Cross Ties
Bridge Timbers
Lumber
Posts
Piling

Treated and Untreated

We solicit your inquiries

Creosoting Plant located
Washington Court House, Ohio
On—Penna. R.R., B. & O. R.R., D. T. & I. R.R.
Operating Mills in Southern Ohio

AMERICAN ELECTRICAL WORKS AMELECTRIC Wires and Cables PHILLIPSDALE, R.I.
Reg. U. S. Pat. Office

Incandescent Lamp Cord

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

Shaw Lightning Arresters
Standard in the Electric Industries for 35 years
Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

Lapp Insulators
Trade Mark
Lapp Insulator Co. Inc. Le Roy, N.Y.

Chapman
Automatic Signals
Charles N. Wood Co., Boston

STANDARD
WIRES, CABLES AND CABLE ACCESSORIES
Manufactured by STANDARD UNDERGROUND CABLE CO.
Boston, New York, Philadelphia, Washington, Pittsburgh, Chicago, Detroit,
St. Louis, San Francisco

ANACONDA
TROLLEY WIRE
ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.
THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

U. S. ELECTRIC
AUTOMATIC SIGNAL
for single track block signal protection
United States Electric Signal Co.
West Newton, Mass.

RAMAPO AJAX CORPORATION
Ramapo Automatic Return Switch Stands for Passing Sidings
RACOR
TRADE MARK
RACOR Tee Rail Special Work.
Manganese Construction
GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

BUDA
ESTABLISHED
1881

Special Track Equipment and Layouts
of all kinds

THE BUDA COMPANY
Harvey (Suburb Chicago) Illinois

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE
CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

DUNDEE "A" AND "B" FRICTION TAPES

DUNDEE
A
FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

are
Okonite
Products

'Nuff Said!

DUNDEE
B
FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

Write for Samples and Circulars

THE OKONITE CO., Passaic, N. J.
Incorporated 1884

Sales Offices: New York—Atlanta—Pittsburgh—San Francisco
Agents: Central Electric Co., Chicago, Ill.; Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.

OKONITE
TRADE MARK
REG. U.S. PAT. OFFICE

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new
Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

No 2

AIMCo
REG. U.S. PAT. OFF.
Electric Railway
Automatic
Signals

for Accessibility and Reliability

EST. 1855 AIMCo INC. 1918
"American"
INSULATING
MACHINERY
COMPANY
REG. U.S. PAT. OFF.

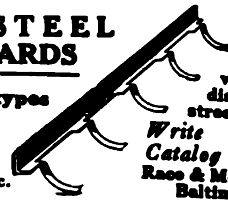
Philadelphia, New York, Paris, England

Sales Agents:
Electric Service Supplies Co.
Philadelphia New York Chicago

GODWIN STEEL PAVING GUARDS

Adapted to all types of rails and paving.

W. S. GODWIN CO., Inc.



Proven by service to economically prevent seepage and disintegration of street railway paving.

Write for Illustrated Catalog No. 20.

Race & McComas Sts.,
Baltimore, Md.

BUCKEYE JACKS

High-grade R. R. Track and Car Jacks

The Buckeye Jack Mfg. Co.
Alliance, Ohio

METAL SAFETY CROSS TIES

Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.

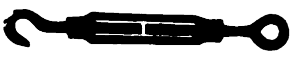
REVOLUTIONIZES ROADBEDS

Write for descriptive folder and quotation.

METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

HUBBARD TURNBUCKLES

Made in three types, Eye and Eye, Eye and Hook and Eye and Clevis.



Type B, Eye and Hook

Double-Dip Hot Galvanized the Hubbard Way.

HUBBARD & COMPANY
PITTSBURGH CHICAGO

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

SPECIALISTS
in the
Design and Manufacture
of
Standard—Insulated—and Compromise Rail Joints

The Rail Joint Company
61 Broadway, New York City

BARBOUR-STOCKWELL CO.
205 Broadway, Cambridgeport, Mass.
Established 1858

Manufacturers of
Special Work for Street Railways
Frogs, Crossings, Switches and Mates
Turnouts and Cross Connections
Kerwin Portable Crossovers
Balkwill Articulated Cast Manganese Crossings

ESTIMATES PROMPTLY FURNISHED

Lorain Special Trackwork
Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

Awebco
WOONSOCKET PLANT — ANCHOR WEBBING COMPANY — PAWTUCKET PLANT

Use only Awebco Tape on your Armatures
Field Coils have better protection when wound with "AWEBCO Tape." Send for samples.

ANCHOR WEBBING COMPANY
300 Brook Street, Pawtucket, Rhode Island

A Single Segment or a Complete Commutator

is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

Cameron Electrical Mfg. Co., Ansonia, Connecticut

THE SEARCHLIGHT SECTION
will find { The man / The position / The plant } *you want*

Put your ad in the Searchlight

FOSTER SUPERHEATERS
A necessity for turbine protection, engine cylinder economy and utilization of superheat for all its benefits
POWER SPECIALTY COMPANY, 111 BROADWAY, NEW YORK
Boston Philadelphia Pittsburgh Detroit Kansas City Dallas Chicago San Francisco London, Eng.

Beckwith-Chandler
VARNISHES and COLORS
for
Brush or Spray Application
Flat Color and Varnish Systems
Enamel Systems
Color Varnish Systems

Developed through years of experience in varnish and color manufacture, especially to meet transportation needs. Easily worked, quick drying—essentially durable.

Full Details on Request

BECKWITH-CHANDLER COMPANY,
193-211 Emmett St., Newark, N. J.
320 Fifth Ave., New York

BECKWITH CHANDLER'S
650

PERFECT
MICANITE
INSULATOR
Reg. U. S. Pat. Off.

ELECTRICAL INSULATION

Micanite armature and commutator insulation, commutator segments and rings, plate, tubes, etc., Empire oiled insulating materials; Linotape; Kablak; Mico; and other products—for the electrical insulating requirements of the railway.

Catalogs will gladly be furnished

MICA INSULATOR COMPANY
Sole Manufacturers of Micanite
Established 1893
68 Church St., New York **542 So. Dearborn St., Chicago**
Works: Schenectady, N. Y.
8-F

THE WORLD'S STANDARD
"IRVINGTON"
Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities

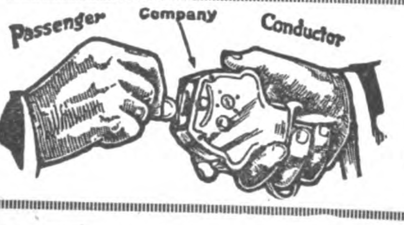
Standard of Quality
REG. U.S. PAT. OFF. TRADE HOPE MARK MADE IN U.S.A.

Quality is the total of good materials and careful manufacture.
That is why, for 40 years, manufacturers of electrical apparatus have found HOPE tapes to be the Standard of Quality.
Let us send you the HOPE Sample Booklet

Electric Tape

HOPE
HOPE
HOPE
HOPE
HOPE

HOPE WEBBING COMPANY, INC.
PROVIDENCE, RHODE ISLAND
New York Troy Chicago



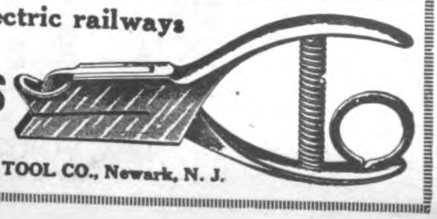
Direct Automatic Registration By the Passengers
Rooke Automatic Register Co.
Providence, R. I.

PS HEATERS

Car Heating and Ventilation
are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

75% of the electric railways
use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.



Heywood-Wakefield
CAR SEATS
of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.
HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York. Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition

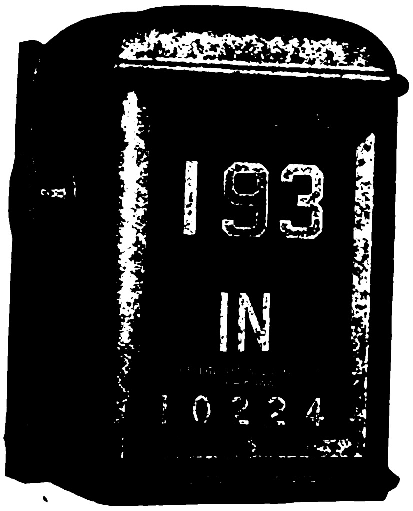
OHMER
FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

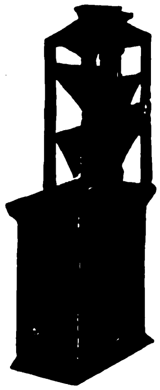
Fare Registration on a Modern Basis



Simple and accurate as the International method has always been the modern tendency in street railway practice toward automatic operation is reflected in the newest type registers, equipped with electric Backs, removing the last drag on the platform worker, and contributing to the quicker handling of traffic.

Registers made in various types to meet the requirements of service on Electric Railways.
Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

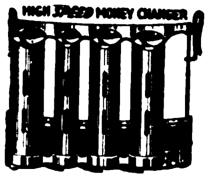


CLEVELAND
FARE BOXES
always
Fit the Fare and
Fare Collection System

The Cleveland Fare Box Co.
Cleveland, Ohio
Canadian Cleveland Fare Box Co., Ltd.
Preston, Ontario

HIGH SPEED MONEY CHANGERS

1924 model —without rivets—ready for delivery

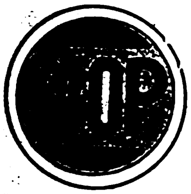


Supplied in one or four tube Combinations

Essential wherever the rapid and accurate handling of change is required. Now included in the standard equipment of largest Traction Companies because conductors demand them.

Prices and Literature sent on request

J. L. GALEF, 75 Chambers St., N. Y. C.
Exclusive Manufacturer's Selling Agent



"OSKELITE"

The Stop Light for street cars. Operates from brake system. Details on request.

The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.

RAILWAY UTILITY COMPANY

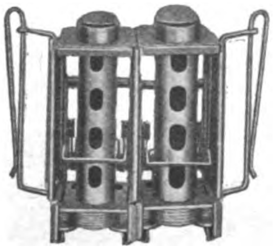
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings;
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for
Catalogue

1328 Broadway
New York, N. Y.

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

ROLLING STOCK
"that rolls"
USUALLY HAS AXLE BEARINGS
lined with
AJAX BULL BEARING ALLOY
BETTER THAN BABBITT
Wears Longer—Runs Cooler—Costs Less
THE AJAX METAL COMPANY
Established 1880
Main Office and Works: Philadelphia, Pa.
New York Chicago Boston Cleveland

Waterproofed Trolley Cord
SILVER LAKE A
Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.
FOR POSITIVE SATISFACTION ORDER SILVER LAKE
If you are not familiar with the quality you will be surprised at its ENDURANCE and ECONOMY.
Sold by Net Weights and Full Lengths
SILVER LAKE COMPANY
Manufacturers of bell, signal and other cords.
Newtonville, Massachusetts

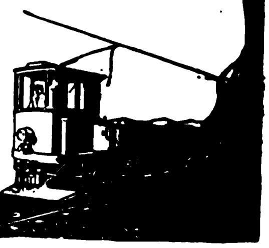
W.T.B.S. PAT MAY 21.08 SEPT 1.03 DEC.29.08 AUG 2.04 JUNE 15.09

Defective Wheels Corrected While They Run
WHEEL TRUING BRAKE SHOES
—keep your cars and wheels in service. Abrasive blocks in various sections correct flattening or wear on any part of flange or tread. Write for booklet.
Wheel Truing Brake Shoe Co.
Detroit, Mich.
Trade Mark—Wheel Truing Brake Shoe

TULC A LUBRICANT
We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC on your equipment
The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

The Kalamazoo Trolley Wheels
have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.
THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

The Differential Car
An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.
The Differential Steel Car Co.
Findlay, Ohio



CARNEGIE for WHEELS AXLES RAILS CROSS TIES
Carnegie Steel Company
PITTSBURGH, PENNA.

MORE-JONES "TIGER" BRONZE AXLE & ARMATURE BEARINGS
Strong—tough—durable anti-frictional economical
MORE-JONES BRASS & METAL CO
ST. LOUIS MISSOURI

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches.............$4.50 an inch
4 to 7 inches.............4.30 an inch
8 to 14 inches.............4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E.R.J.

POSITIONS VACANT

SUPERINTENDENT of transportation wanted; must be good executive and disciplinarian and thoroughly familiar with handling city traffic. P-655, Electric Railway Journal, 10th Ave. at 36th St., New York.

WANTED: By a large special track work manufacturer in the East, a draftsman who has thorough knowledge of mathematics, particularly trigonometry and logarithms. P-658, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

POSITIONS WANTED

AS master mechanic or with chance for advancement; experienced low- and high-voltage d.c. equipment, passenger and freight, city and interurban; expert on motor and controller repairs. PW-656, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

CORRESPONDENCE is desired with executives requiring the services of a capable man to manage the freight and passenger service of a large interurban road. PW-659, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT of transportation, at present with large property, solicits correspondence with managers that are in the field for a superintendent of wide experience. Capable progressive and recognized as an economical painstaking official. High-grade references. Personal reasons for desiring a change. PW-653, Electric Railway Journal, Leader-News Building, Cleveland, Ohio.

WANTED to locate with city or interurban railway in equipment, distribution, purchasing, construction, traffic and transportation or other capacity requiring engineering ability. Over ten years' experience in railway and power manufacturing, installation, operating. Your proposition solicited. PW-651, Electrical Railway Journal, Old Colony Bldg., Chicago, Illinois.

WANTED

Power Plants

We are in the market to purchase abandoned Railway and Municipal Power Plants—any size.

L. J. LAND
207 Centre Street, New York City

WANTED

Single Track Right Angle Street Railway Crossing

1—Used, 4-ft. 8½-in. gauge, of 6-in. high tee or girder rail.

W-660, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
509 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
Mohr Bldg., San Francisco

Important

Original letters of recommendations or other papers of value should not be enclosed to unknown correspondents — send copies.

0195

50 Ballast Cars

32—Side Botom Dump, self clearing, 37 cubic yards capacity, 100,000 lb. metal arch bar trucks—M.C.B. & I.C.C.

18—Same Design, rebuilt into flat bottom gondolas.

ZELNICKER IN ST. LOUIS

75-ton Baldwin Saddle Tank
40-ton Baldwin Saddle Tank
21-ton Davenport Saddle Tank
nearly New.

Locomotives, Cars, Piling, Hoists, Rail, Cable. Send for Bulletin 315.

FOR SALE

RAILWAY MOTORS

2—Unused General Electric, type 210-H, 50% of market price.

GEORGE SACHSENMAIER CO.
926 N. Third St., Philadelphia, Pa.

FOR SALE

50—G. E. No. 80-A Motors.
50—Controllers, K-28-B; K-12.
35—B-2 Compressors.

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

BARGAIN PRICE

EXCELLENT CONDITION

20—50 ft. Steel Cars

Extreme width 9 ft. 2 in. Extreme height 12 ft. 2 in. Truck center 30 ft. 10 in. Hunter signs. Earll catchers. G. E. air brakes. Reversible cross seats, seating 52. Brill 39-E-1 Trucks, 4 ft. 6 in. Wheel base 30 in., 21-in. wheels.

Electrical equipment includes 2 G. E.-201, 60-hp. Ventilated Motors. Type M. Control for double end operation. Code "Constano."

19 similar cars 43 ft. long, seating 40. Equipped with 2 G. E.-203 A Motors. K-36-H Controllers. Code "Conx."

Transit Equipment Company
Cars *Motors*
501 Fifth Avenue, New York.

BARGAIN PRICE
EXCELLENT CONDITION

ONE PORTABLE SUB-STATION

G. E. 250 kw. Now working on 33,000, 60 cy. line, 650 D.C., 1,200 r.p.m.

Photographs, price and further description on application.

Kansas City Kaw Valley & Western Ry. Co.
511 New Jersey Ave., Kansas City, Kansas.

"SEARCHLIGHT"

Opportunity Advertising

—to help you get what you want.

—to help you sell what you no longer need.

Take advantage of it — For Every Business Want

"Think SEARCHLIGHT First"

0168

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Receivers, Aftercoolers
Ingersoll-Rand Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse Elec. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stand
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Johnson & Co., J. R.
St. Louis Car Co.

Axles, Bus
Standard Steel Co.

Axle Straighteners
Columbia M. W. & M. I. Co.

Axles, Car Wheel
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
Taylor Electric Truck Co.
Westinghouse Elec. & M. Co.

Babbitting Devices
Columbia M. W. & M. I. Co.

Babbitt Metal
Ajax Metal Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co., The

Batteries, Dry
Nichols-Lintern Co.

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
General Electric Co.
A. Gilbert & Sons, B. F. Co.
More-Jones Brass & Metal Co.
Taylor Electric Truck Co.
Westinghouse Elec. & M. Co.

Bearings, Center and Roller Side
Baldwin Locomotive Wks.
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car Heating Co.
Elec. Service Supplies Co.

Benders, Rail
Railway Track-work Co.

Boiler Tubes
Nat'l Tube Co.

Boilers
Babcock & Wilcox Co., The

Bond Testers
Amer. Steel & Wire Co.
Elec. Service Supplies Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Indianapolis Switch & Frog Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
Westinghouse Elec. & M. Co.

Book Publishers
McGraw-Hill Book Co., Inc.

Brackets and Cross Arms (See also Poles, Ties, Posts etc.)
American Bridge Co.
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Nat'l Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Brake Shoe & Fdry. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Taylor Electric Truck Co.
Wheel Truing Brake Shoe Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
National Brake Co.
Taylor Electric Truck Co.
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Westinghouse Elec. & M. Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Bunkers, Coal
American Bridge Co.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.
Yellow Coach Mfg. Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.

Cables
(See Wires and Cables)

Calculating Machines
W. A. Morschhauser

Cambric Tapes, Yellow & Black Varnish
Irvington Varnish & Ins. Co.

Cambric Yellow & Black Varnish
Mica Insulataor Co.

Carbon Brushes
(See Brushes, Carbon)

Car Lighting Apparatus
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heating Co.
Westinghouse Elec. & M. Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Differential Steel Car Co., Inc.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Cars, Gas Rail
St. Louis Car Co.

Cars, Passenger, Freight Express, etc.
American Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Thomas Car Wks., Perley A.
Wason Mfg. Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

Cars, Self-Propelled
General Electric Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
More-Jones Brass & Metal Co.

Castings, Funnel
Wharton, Jr. & Co., Inc., Wm.

Castings, Gray Iron and Steel
American Bridge Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Wharton, Jr., & Co., Inc., Wm.

Castings, Malleable and Brass
Amer. Brake Shoe & Fdry. Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.

Catchers and Retrievers, Trolley
Earll, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceilings, Plywood, Panels
Haskelite Mfg. Co.

Change Carriers
Cleveland Fare Box Co.
Galef, J. L.

Circuit Breakers
General Electric Co.
Westinghouse Elec. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. M. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
WestinghouseElec . & M. Co.

Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
Ohio Brass Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coils, Armature and Field
Columbia M. W. & M. I. Co.
General Electric Co.
Economy Electric Devices Co.
Westinghouse Elec. & M. Co.

Coil Banding and Winding Machines
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Westinghouse Elec. & M. Co.

Coils, Choke and Kicking
Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Coin-Counting Machines
Cleveland Fare Box Co.
Galef, J. L.
International Register Co. The
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Galef, J. L.

Coin Wrappers
Cleveland Fare Box Co.
Galef, J. L.

Commutator Slotters
Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.

Compressors, Air, Portable
Ingersoll-Rand Co.

Compressors, Gas
Ingersoll-Rand Co.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll Rand Co.
Westinghouse Elec. & M. Co.

Condensor Papers
Irvington Varnish & Ins. Co.

Conduits, Underground
Std. Underground Cable Co.

Connectors, Solderless
Westinghouse Elec. & M. Co.

Connectors, Trailer Car
Consolidated Car Heating Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Allis-Chalmers Mfg. Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Controller Regulators
Electric Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse Elec & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Conveying and Hoisting Machinery
Columbia M. W. & M. I. Co.

Copper Wire
Anaconda Copper Mining Co.
Rome Wire Co.

Cord, Bell, Trolley, Register, etc.
Brill Co., The J. G.
Electric Service Supplies Co.
International Register Co., The
Roeblings Sons Co., John A.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Electric Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Cranes
Allis-Chalmers Mfg. Co.
Universal Crane Co.

Cranes Gas or Electric
Universal Crane Co.

Cranes Locomotive
Universal Crane Co.

Cranes Motor Truck
Universal Crane Co.

Cranes Portable
Universal Crane Co.

Cross Arms (See Brackets)

Crossings
Ramapo Ajax Corp.

Crossing Foundations
International Steel Tie Co.

Crossing Frogs and Switches
Ramapo Ajax Corp.
Wharton, Jr., & Co.,Inc.,Wm.

Crossings, Manganese
Bethlehem Steel Co.
Indianapolis Switch & Frog Co.
Ramapo Ajax Corp.

Crossing Signals .See Signal Systems, Highway Crossing)

Crossings, Track, (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Crushers, Rock
Allis-Chalmers Mfg. Co.

Curtains and Curtain Fixtures
Brill Co., The J. G.
Electric Service Supplies Co.
Morton Mfg. Co.

Cutouts
Johns Pratt Co.

Dealers' Machinery
Electric Equipment Co.
Transit Equipment Co.

Derailing Switches, Tee Rail
Ramapo Ajax Corp.

Destination Signs
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.

Detective Service
Wish Service, P. Edward

Door Operating Devices
Consolidated Car Heating Co.
National Pneu. Co, Inc.

Doors and Door Fixtures
Brill Co., The J. G.
General Electric Co.
Hale-Kilburn Co.
St. Louis Car Co.

Doors, Folding Vestibule
National Pneumatic Co., Inc.

Draft Rigging, (See Couplers)

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
American Steel & Wire Co.
Electric Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Electric Service Supplies Co.

Ears
Ohio Brass Co.

Electric Grinders
Railway Track-work Co.

Electric Wires & Cables
Rome Wire Co.

Electrodes, Carbon
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Electrodes, Steel
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Electrical Wires and Cables
American Elec. Works
Roeblings Sons Co., J. A.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. E.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbens, J. Rowland
Buchanan & Laying
Day & Zimmerman, Inc.
Drum & Co., A. L.
Feustel, Robert M.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelly Cooke & Co.
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Richey, Albert S.
Sanderson & Porter
Shaw, Henry M.
Stevens & Wood, Inc.
Stone & Webster
Wortham, Edwin

Engines, Gas, Oil and Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse Elec. & M. Co.

Expansion Joints, Track
Wharton, Jr., & Co., Inc., Wm.

Fare Boxes
Cleveland Fare Box Co.
Economy Electric Devices Co.
Galef, J. L.
Nat'l Ry. Appliance Co.
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Electric Service Sup. Co.
Star Brass Works

Fibre and Fibre Tubing
Westinghouse Elec. & M. Co.

Field Coils (See Coils)

Flangeway Guards
Godwin Co., Inc., W. S.

Flaxlinum Insulation
Nat'l Ry. Appliance Co.

Floodlights
Electric Service Sup. Co.

Forgings
Carnegie Steel Co.
Columbia M. W. & M. I. Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track. (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Furnaces, Electric
American Bridge Co.

Fuses and Fuse Boxes
Columbia M. W. & M. I. Co.
Consolidated Car Heating Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Fuses, Refillable
Columbia M. W. & M. I. Co.
General Electric Co.

Gaskets
Power Specialty Co.
Westinghouse Tr. Br. Co.

Gasolene Torches
Economy Electric Devices Co.

Gas-Electric Cars
General Electric Co.

Gas Producers
Westinghouse Elec. & M. Co.

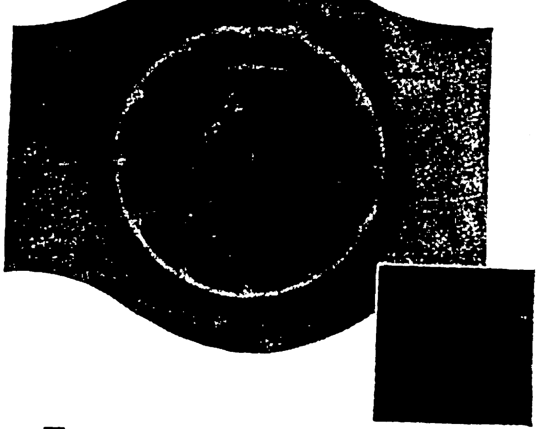
Gates, Car
Brill Co., The J. G.

Gear Blanks
Bethlehem Steel Co.
Carnegie Steel Co.

Gear Cases
Chillingworth Mfg. Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Westinghouse Elec. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.



Ever stop your watch by winding it?

Overwinding will put the average retriever or catcher out of action. Added maintenance expense.

EARLL
Catchers and Retrievers

cannot be overwound. The one-piece tension spring maintains steady even tension throughout long years of service. It requires a minimum of winding effort, saving time, avoiding delays.

This and four other exclusive Earll Catcher and Retriever Features are vitally important. Get the whole story.

C. I. Earll York, Pa.

THORNTON

The trolley wheel with the high mileage side bearing

Thornton Wheels with Thornton side bearings are unusually long-lived, require less lubrication, and less maintenance. They are free from vibration and noiseless. No bushings. *Investigate them.*

Bearings make fifty thousand or more miles

Send for descriptive circular

Thornton Trolley Wheel Co.,
Incorporated
Ashland, Kentucky

B. A. HEGEMAN, Jr., President C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

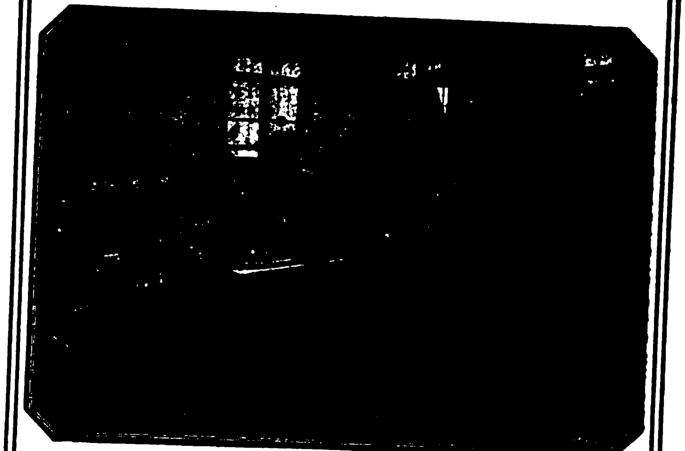
National Railway Appliance Co.

Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

- Tool Steel Gears and Pinions
- Pittsburgh Forge & Iron Company's Products
- Anglo-American Varnish Co., Varnishes, Enamels, Etc.
- National Hand Holds
- Drew Line Material and Railway Specialties
- Genesco Paint Oils
- Turnstile Car Corporation—Turnstiles
- Dunham Hopper Door Device
- Anderson Slack Adjusters
- Economy Electric Devices Co., Power Saving and Inspection Meters
- Ft. Pitt Spring & Mfg. Co. Springs
- C.-H. Electric Heaters
- Garland Ventilators
- E-Z Car Control Safety Devices
- Lind Aluminum Field Coils
- Flaxlinum Insulation
- Yellow Coach Mfg. Co., Buses

A Reliable Air Supply
for
Shop, Switch or Signal Service



There's something built into a Class "ER" compressor which makes this smaller type stand out as superior in the test of constant, reliable service. That something is *quality*.

An Ingersoll-Rand Class "ER" unit gives to the user of a small volume of air a supply which he can always depend upon. Also, efficient design minimizes the power requirement and automatic lubrication and valve action keep down need of attendance.

When driven by an electric motor with short belt drive this machine can be equipped with an improved automatic start and stop control—an ideal control for switch and signal service.

Bulletin No. 3430

INGERSOLL-RAND COMPANY
11 Broadway, New York City

Atlanta
Birmingham
Boston
Butte
Chicago
Cleveland

Dallas
Denver
Detroit
Duluth
El Paso
Houghton

Joplin
Knoxville
Los Angeles
New Orleans
Philadelphia
Pittsburgh

Salt Lake City
San Francisco
Scranton
Seattle
St. Louis
Washington, D. C.

For Canada, refer to Canadian Ingersoll-Rand Co., Limited
260 St. James Street, Montreal

Ingersoll-Rand

706-C

Generators
Allis-Chalmers Mfg. Co.
English Electric Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co., The

Goggles, Safety
Indianapolis Switch & Frog Co.

Gongs (See Bells and Gongs)

Greases (See Lubricants)

Grinders and Grinding Supplies
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Blocks and Wheels
Railway Track-work Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

Guards, Cattle
American Bridge Co.

Guards, Trolley
Electric Service Sup. Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works
Thornton Trolley Wheel Co.

Headlights
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.

Headlining
Haskelite Mfg. Co.

Heaters, Car (Electric)
Consolidated Car Heating Co.
Economy Electric Devices Co.
Gold Car Heating & Lighting Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Electric Service Sup. Co.
Smith Heater Co., Peter Wm.

Helmets, Welding
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Hoists and Lifts
Columbia M. W. & M. I. Co.

Hoists, Portable
Ingersoll-Rand Co.

Hose, Bridge
Ohio Brass Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating, Signals
Nichols-Lintern Co.
Oskel Equipment Co.

Instruments, Measuring, Testing and Recording
Economy Electric Devices Co.
Electric Service Sup. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Insulating Cloth, Paper and Tape
Anchor Webbing Co.
General Electric Co.
Hope Webbing Co.
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Standard Underground Cable Co.
Westinghouse E. & M. Co.

Insulating Machinery
Amer. Ins. Machinery Co.

Insulating Silk
Irvington Varnish & Ins. Co.

Insulating Varnishes
Irvington Varnish & Ins. Co.

Insulation (See also Paints)
Anderson M. Co., A. & J. M.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Westinghouse Elec. & M. Co.

Insulation Cloth Paper & Tape
Mica Insulator Co.

Insulation, Slot
Irvington Varnish & Ins. Co.

Insulator Pins
Electric Service Sup. Co.
Hubbard & Co.

Insulators (See also Line Material)
Anderson M. Co., A. & J. M.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co.
Westinghouse Elec. & M. Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Hoists and Lifts)
Buckeye Jack Mfg. Co.
Buda Co.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
National Ry. Appliance Co.
Templeton Kenly & Co.

Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.

Junction Boxes
Standard Underground Cable Co.

Lamp Guards and Fixtures
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc and Incandescent (See also Headlights)
Anderson M. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Arresters
Shaw, Henry M.

Lightning Protection
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Westinghouse Elec. & M. Co.

Line Material (See also Brackets, Insulators, Wires, Etc.)
Anderson M. Co., A. & J. M.
Archbold-Brady Co.
Columbia M. W. & M. I. Co.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
English Electric Co.
General Electric Co.
Hubbard & Co.
More-Jores Brass & Metal Co.
Westinghouse Elec. & M. Co.

Locking Spring Boxes
Wharton, Jr. & Co., Inc., Wm.

Locomotives, Electric
Baldwin Locomotive Wks.
General Electric Co.
Westinghouse Elec. & M. Co

Lubricating Engineers
Galena-Signal Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Oil Co.
Universal Lubricating Co.

Lumber (See Poles, Ties, etc.)

Machine Tools
Columbia M. W. & M. I. Co

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.
Indianapolis Switch & Frog Co.
Wharton, Jr., & Co., Inc.,

Manganese Steel Switches, Frogs and Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp

Meters, Car Watt-Hour
Economy Electric Devices Co.

Mica
Mica Insulator Co.

Motor and Generator Sets
General Electric Co.

Motor Buses (See Buses, Motor)

Motormen's Seats
Brill Co., The J. G.
Electric Service Sup. Co.
St. Louis Car Co.
Wood Co., Chas. N.

Motors, Electric
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Nuts and Bolts
Allis-Chalmers Mfg. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia M. W. & M. I. Co.
Hubbard & Co.

Oils (See Lubricants)

Packing
Electric Service Sup. Co.
Power Specialty Co.
Westinghouse Tr. Br. Co.

Paints & Varnishes Insulating
Mitchell-Rand Mfg. Co.

Paints & Varnish Preservatives
Beckwith-Chandler Co.
Dixon Crucible Co., Joseph

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co.

Pavement Breakers
Ingersoll-Rand Co.

Paving Brick Vitrified
National Paving Brick Mfgrs. Ass'n.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdry. Co.

Pickups, Trolley Wire
Electric Service Sup. Co.
Ohio Brass Co.

Pinion Pullers
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Electric Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Pipe
National Tube Co.

Pipe Fittings
Power Specialty Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Electric Service Sup. Co.

Pneumatic Tools and Accessories
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Pole Reinforcing
Drew Elec. & Mfg. Co.
Hubbard & Co.

Poles and Ties, Treated
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.

Poles, Metal Street
Bates Expanded Steel Truss Co.
Electric Ry. Equip. Co.
Hubbard & Co.

Poles, Ties, Posts, Piling and Lumber
Baker Wood Preserving Co.
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.

Poles, Trolley
Anderson M. Co., A. & J. M.
Columbia M. W. & M. I. Co
National Tube Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equip. Co.
Electric Service Sup. Co
National Tube Co.

Porcelain, Special High Voltage
Lapp Insulator Co.

Portable Grinders
Buda Co.

Potheads
Okonite Co.

Power Saving Devices
Economy Elec. Devices Co.
Nat'l Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Westinghouse Elec. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
International Register Co., The
Wood Co., Chas. N

Rail Braces and Fastenings
Ramapo Ajax Corp.

Rail Joints
Carnegie Steel Co.
Rail Joint Co.

Rail Joints, Welded
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.

Rail Grinders (See Grinders)

Rails, Steel
Carnegie Steel Co.

Railway Paving Guards Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Consolidated Car Heating Co.
Westinghouse Elec. & M. Co.

Railway Welding (See Welding Processes)

Rail Welding
Metal & Thermit Corp.
Rail Welding & Bonding Co.

Rattan
Brill Co., The J. G.
Electric Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Electric Service Sup. Co.
International Reg. Co., The
Ohmer Fare Register Co.
Rooke Automatic Reg. Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.

Repair Work (See also Coils)
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Replacers, Car
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.

Resistance, Grid
Columbia M. W. & M. I. Co.

Resistance, Wire and Tube
General Electric Co.
Westinghouse Elec. & M. Co.

Resistances
Consolidated Car Heating Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse Elec. & M. Co.

Roofs
Haskelite Mfg. Co.

Sanders, Track
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.

Sash Fixtures, Car
Brill Co., The J. G.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Electric Service Sup. Co.

Seating Materials
Brill Co., The J. G.

Seats, Bus
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Corp.
St. Louis Car Co.

Second-Hand Equipment
Electric Equipment Co.
Sachsenmaier Co., Geo.
Standard Rail & Steel Co.
Transit Equipment Co.
Zelnicker Supply Co., W. A.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Hubbard & Co.

Shovels, Power
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.

Signals, Car Starting
Consolidated Car Heating Co.
Electric Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Block
Electric Service Sup. Co.
Nachod Signal Co., Inc.
Union Switch & Signal Co.
U. S. Electric Signal Co.
Wood Co., Chas. N.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
U. S. Electric Signal Co.

Slack Adjusters (See Brake Adjusters)

Slag
Carnegie Steel Co.

Sleet Wheels and Cutters
Anderson M. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Electric Ry. Equip. Co.
Electric Service Sup. Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car Fender Co.

Snow Sweeper, Rattan
Heywood-Wakefield Co.

Soldering and Brazing (See Welding Processes and Apparatus)

Spikes
Amer. Steel & Wire Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co., The

Splicing Compounds
Westinghouse Elec. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Taylor Electric Truck Co.

Sprinklers, Track and Road
Brill Co., The J. G.

Steel and Steel Products
Morton Mfg. Co.

Steps, Car
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse Elec. & M. Co.

Stop, Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Superheaters
Babcock & Wilcox Co.
Power Specialty Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switch Stands
Indianapolis Switch & Frog Co.
Ramapo Ajax Corp.

Switches and Switchboards
Allis-Chalmers Mfg. Co.
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track, Special Work)

Tampers, Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail, Special Track Work
Bethlehem Steel Co.
Rampo Ajax Corp.

Telephones and Parts
Electric Service Sup. Co.

Terminals, Cable
Standard-Underground Cable Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heating Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers and Destroyers
Electric Service Sup. Co.

Ties, All Metal
Metal Safety R'way Tie Co.

Ties and Tie Rods, Steel
American Bridge Co.
Barbour-Stockwell Co.
Carnegie Steel Co.
International Steel Tie Co.

Tires, Mechanical
Dayton Mechanical Tie Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

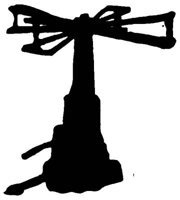
Tongue Switches
Wharton, Jr., & Co., Inc., Wm.

Capital To
Electrical engineer wi
sires to enter busi
contractor, dealer
B. O-865, Elec. Wo
Chicago.

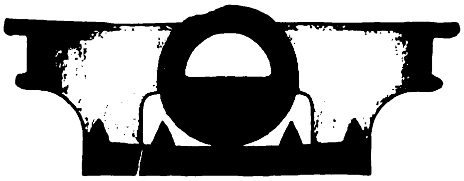
Don't Overlook Opportunities

Men who regularly keep in touch with the market through other channels often overlook the many opportunities that are to be found in the

SEARCHLIGHT SECTION
For Every Business Want
"Think SEARCHLIGHT *First"*
0156



Gets Every Fare
PEREY TURNSTILES or PASSIMETERS
Use them in your Prepayment Areas and Street Cars
Perey Manufacturing Co., Inc.
30 Church Street, New York City



STUCKI SIDE BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.

HALE-KILBURN CAR SEATS
For Every Class of Service
General Offices and Works: Philadelphia
Offices: New York, Chicago, St. Louis, Washington, San Francisco

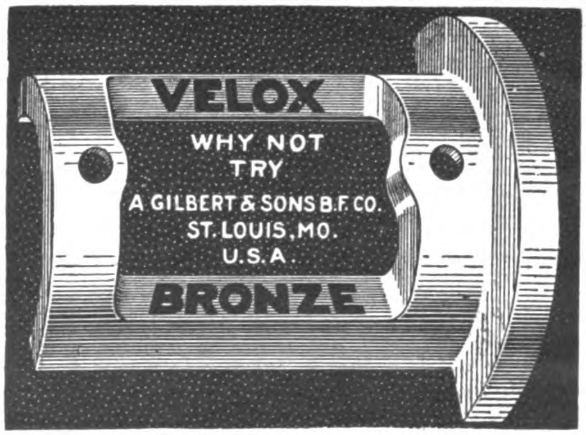
THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED

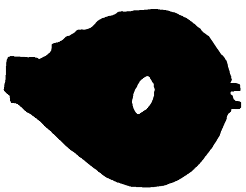
No. 478E
GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

T. S. Q
says
"I save equipment expense".

Tool Steel Quality

The Tool Steel Gear and Pinion Co.
CINCINNATI, O.


VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE



CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. *Write Us.*
Chillingworth Mfg. Co.
Jersey City, N. J.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

Tool Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Tools, Track and Misc.
Amer. Steel & Wire Co.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Hubbard & Co.
Railway Track-work Co.

Towers and Transmission Structures
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Westinghouse Elec. & M. Co.

Track Grinders
Metal & Thermit Corp.
Railway Track-Work Co.

Trackless Trolliears
Brockway Motor Truck Co.
Pierce-Arrow Motor Car Co.
St. Louis Car Co.

Track, Special Work
Barbour-Stockwell Co.
Bethlehem Steel Co.
Buda Co.
Columbia M. W. & M. I. Co.
Indianapolis Switch & Frog Co.
New York Switch & Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co

Transmission Towers & Structures
Amer. Bridge Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Anderson M. Co., A. & J. M
Electric Service Sup. Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse Elec. & M. Co

Trolley Materials
Electric Service Sup. Co
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolley Shoes
Economy Elec. Devices Co.
Miller Trolley Shoe Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wheels, Bushings
More-Jones Brass & Metal Co.

Trolley Wheels & Harps
More-Jones Brass & Metal Co.
Thornton Trolley Wheel Co

Trolley Wire
American Elec'l Works
Amer. Steel & Wire Co.
Anaconda Copper Mining Co
Bridgeport Brass Co.
Roeblings Sons Co., J. A.
Rome Wire Co.

Trucks, Car
Baldwin Locomotive Wks.
Brill Co., The J. G.
Bemis Car Truck Co.
St. Louis Car Co.
Taylor Electric Truck Co.
Westinghouse Elec. & M. Co

Tubing, Steel
National Tube Co.

Tubing, Yellow & Black Flexible Varnishes
Irvington Varnish & Ins. Co

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Turbines, Water
Allis-Chalmers Mfg. Co.

Turnstiles
Electric Service Supplies Co
Perey Mfg. Co., Inc.

Turntables
Indianapolis Switch & Frog Co.

Vacuum Impregnation
Allis Chalmers Mfg. Co.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers
Irvington Varnish & Ins. Co

Varnish Silks
Irvington Varnish & Ins. Co

Varnishes (See Paints, etc.)

Ventilators, Car
Brill Co., The J. G.
National Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Vitrified Paving Brick
National Paving Brick Mfgs. Ass'n.

Welded Rail Joints
Electric Ry. Improvement Co.
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.

Welders, Portable Electric
Electric Ry. Imp. Co.
Indianapolis Switch & Frog Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.

Welding Processes and Apparatus
Elec. Ry. Improvement Co.
General Electric Co.
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
National Ry. Appliance Co
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co
Westinghouse Elec. & M Co

Welding Steel
Electric Ry. Improvement Co.
Indianapolis Switch & Frog Co
Railway Track-work Co

Wheel Guards (See Fenders and Wheel Guards)

Wheel Grinders
Wheel Truing Brake Shoe Co

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Assn. of Mfrs. of Chilled Car Wheels

Wheels, Car, Steel & Steel Tire
Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Electric Ry. Equip. Co.
Elec. Service Supplies Co.
General Electric Co.
Gilbert & Sons, B. F. A.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Wire Rope
Amer. Steel & Wire Co.
Roeblings Sons Co., J. A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Bridgeport Brass Co.
General Electric Co.
Okonite Co.
Roeblings Sons Co., J. A. Co
Rome Wire Co.
Standard Underground Cable Co
Westinghouse Elec. & M. Co

Wood Preservatives
Baker Wood Preserving Co.

Woodworking Machinery
Allis-Chalmers Mfg. Co.

ALPHABETICAL INDEX TO ADVERTISERS

Page
Ajax Metal Co.............. 56
Allis-Chalmers Mfg. Co......... 44
Allison Co., J. E............ 28
Amer. Brake Shoe & Fdy. Co.. 50
American Car Co............ 63
American Electrical Works..... 51
American Insulating Machinery Co. 52
American Steel & Wire Co..... 52
Anaconda Copper Mining Co.... 51
Anchor Webbing Co.......... 53
Anderson Mfg. Co., A. & J. M.. 44
Archbold-Brady Co.......... 29
Arnold Co., The............ 28
Assn. of Mfrs. of Chilled Car Wheels 42

Babcock & Wilcox Co......... 53
Baker Wood Preserving Co..... 51
Baldwin Locomotive Works.... 48
Barbour-Stockwell Co......... 53
Bates Expanded Steel Truss Co. 10
Beckwith-Chandler Co......... 54
Beeler, John A............. 28
Bell Lumber Co............. 62
Bemis Car Truck Co.......... 40
Bethlehem Steel Co.......... 35
Bibbins, J. Rowland.......... 28
Bonney-Vehslage Tool Co...... 54
Bridgeport Brass Co.......... 22
Brill Co., The J. G........... 63
Buchanan & Layng Corp...... 29
Buckeye Jack Mfg. Co......... 52
Buda Co.................. 52

Cameron Electric Mfg. Co..... 53
Carnegie Steel Co........... 56
Chillingworth Mfg. Co........ 61
Cleveland Fare Box Co........ 55
Collier, Inc., Barron G........ 34
Columbia M. W. & M. I. Co.... 41
Consolidated Car Fender Co.... 47
Consolidated Car Heating Co... 36

Day & Zimmermann, Inc...... 29
Dayton Mechanical Tie Co....32-33
Differential Steel Car Co., The.. 56
Dixon Crucible Co., Joseph..... 47
Drum & Co., A. L........... 28

Earll, C. I................. 59
Economy Electric Devices Co... 15
Electric Equipment Co........ 57
Electric Ry. Equipment Co..... 51
Elec. Ry. Improvement Co..... 43
Electric Service Supplies Co.... 9
English Electric Co.......... A

"For Sale" Ads............. 57
Ford, Bacon & Davis......... 28

Galef, J. L................. 55
Galena-Signal Oil Co......... 25
General Electric Co..26, Back Cover
Gilbert & Sons, B. F. Co., A.... 61
Godwin & Co., Inc., W. S...... 52
Gold Car Heating & Ltg. Co.... 61

Hale-Kilburn Co............ 61
Haskelite Mfg. Co........... 18
"Help Wanted" Ads.......... 57
Hemphill & Wells 28
Heywood-Wakefield Co........ 54
Holst, Englehard W.......... 28
Hope Webbing Co........... 54
Hubbard & Co.............. 52

Indianapolis Switch & Frog Co. 30
Ingersoll-Rand Co. 59
International Creosoting & Construction Co............. 12
International Register Co., The. 55
International Steel Tie Co., The. 7
Irvington Varnish & Insulator Co. 54

Jackson, Walter 28
Jeandron, W. J............. 50
Johnson & Co., Inc., J. R...... 61
Johnson Fare Box Co......... 55

Kansas City & Western Ry. Co.. 57
Kelly Cooke & Co........... 29
Kuhlman Car Co............. 63

Land, L. J................. 57
Lapp Insulator Co., Inc........ 51
Le Carbone Co.............. 50
Lorain Steel Co............. 53

McGraw-Hill Book Co., Inc.... 29
McGuire-Cummings Mfg. Co.... 24
Metal & Thermit Corp........ 45
Metal Safety Railway Tie Co.. 52
Mica Insulator Co........... 54
Miller Trolley Shoe Co..Front Cover
Mitchel-Rand Mfg. Co........ 46
More-Jones Brass & Metal Co... 56
Morton Mfg. Co............. 62

Nachod Signal Co........... 43
National Brake Co........... 27
National Paving Brick Mfrs. Assn. 23
National Pneumatic Co., Inc.... 11
National Pole Co............ 17
National Ry. Appliance Co.... 59
National Tube Co........... 14
New York Switch & Crossing Co. 52
Nichols-Lintern Co.......... 62
Nuttall Co., R. D............ 50

Ohio Brass Co............... 5
Ohmer Fare Register Co....... 55
Okonite Co., The............ 52
Ong, Joe R................ 28
Oskel Equipment Co.......... 55

Parsons, Klapp, Brinckerhoff & Douglas 29
Perey Mfg. Co., Inc.......... 61
Positions Wanted and Vacant... 57
Power Specialty Co.......... 53

Rail Joint Co............... 53
Rail Welding & Bonding Co.... 16
Railway Track-work Co........ 6
Railway Utility Co........... 55
Ramapo Ajax Corp........... 51
Richy, Albert S.............. 28
Roebling's Sons Co., John A.... 51
Rome Wire Co.............. 46
Rooke Automatic Register Co... 54

Sachsenmaier Co., Geo........ 57
St. Louis Car Co............ 49
Samson Cordage Works....... 62
Sanderson & Porter.......... 28
Searchlight Section 57
Shaw, Henry M............. 51
Silver Lake Co.............. 56
Smith Heater Co., Peter....... 54
Standard Underground Cable Co. 51
Star Brass Works 56
Stevens & Wood, Inc.......... 28
Stone & Webster 28
Stucki Co., A............... 61

Taylor Electric Truck Co....... 49
Templeton, Kenly & Co........ 37
Thomas Car Works, Perley A... 48
Thornton Trolley Wheel Co.... 59
Tool Steel Gear & Pinion Co.... 61
Transit Equipment Co......... 57

Union Switch & Signal Co...... 8
U. S. Electric Signal Co....... 51
Universal Crane Co.......... 19
Universal Lubricating Co...... 56

"Want" Ads................ 57
Wason Mfg. Co.............. 63
Westinghouse Elec. & Mfg. Co..2, 4
West'gh'se Traction Brake Co... 13
Wharton, Jr., & Co., Wm...... 45
Wheel Truing Brake Shoe Co... 56
White Eng. Corp., The J. G.... 28
Wish Service, The P. Edw...... 29
Wood Co., Chas. N........... 51
Wortham, Edwin 28

Yellow Coach Co............20-21

Zeinicker Supply Co., Walter A. 57

100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

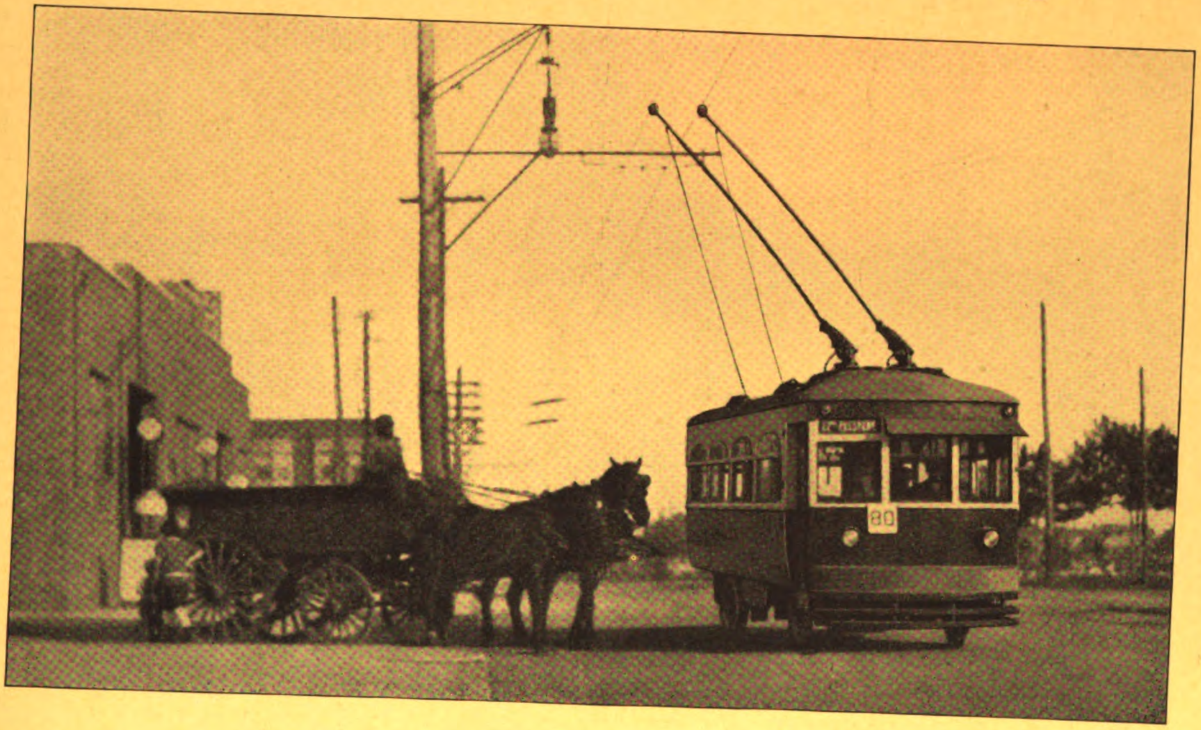
SAMSON SPOT WATERPROOFED TROLLEY CORD

Trade Mark Reg. U. S. Pat. Off.
Made of extra quality stock firmly braided and smoothly finished.
Carefully inspected and guaranteed free from flaws.
Samples and information gladly sent.
SAMSON CORDAGE WORKS, BOSTON, MASS.

N-L VENTILATORS
Write for new catalogue
"Superior Ventilation"
THE NICHOLS-LINTERN COMPANY
7960 Lorain Ave., Cleveland, Ohio.
N-L Products manufactured and sold in Canada by
Railway and Power Engineering Corporation, Ltd.
133 Eastern Avenue, Toronto, Ontario

Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

Brill Rail-less Cars Serve Philadelphia

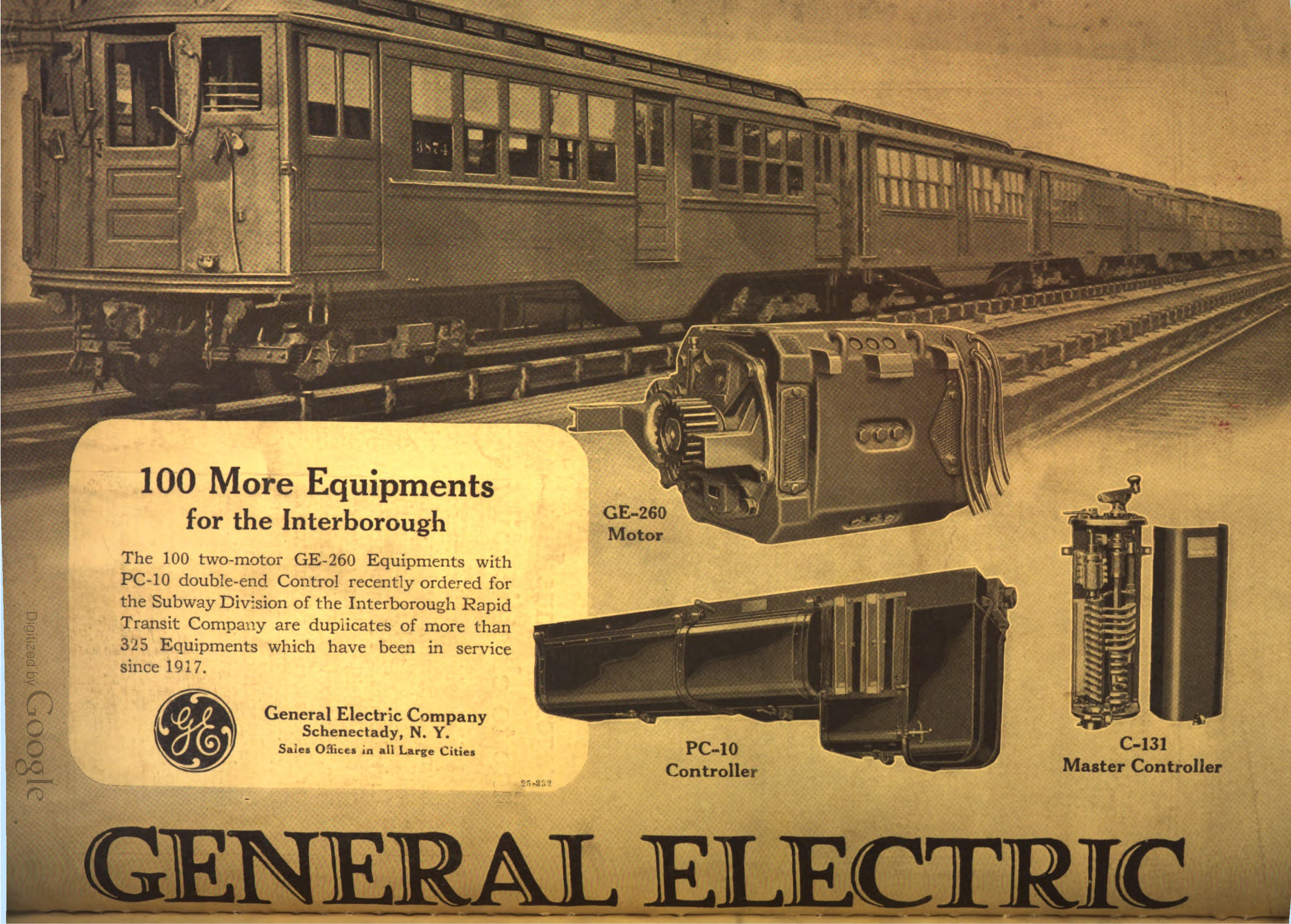


Oregon Avenue Installation acting as feeder line to electric railway cars

To Philadelphia goes the honor of having in operation the largest installation of Rail-less Cars in the United States. All cars operated are of the Brill Rail-less street car type, mounted on Brill Rail-less car chasses, equipped with two 25 Hp. motors. They are furnishing transportation over a route which previously was without public conveyance, and act as feeders to electric lines intersecting with Oregon Avenue.

Brill Rail-less Cars offer electric railways a type of equipment capable of meeting the transportation requirements of new territories adjacent to their lines at comparatively low initial and operating costs.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — G.C. KUHLMAN CAR CO. — WASON MANF'G CO.
ST. LOUIS MO. CLEVELAND, OHIO. SPRINGFIELD, MASS.


GE-260
Motor
PC-10
Controller
C-131
Master Controller
3874

100 More Equipments
for the Interborough

The 100 two-motor GE-260 Equipments with PC-10 double-end Control recently ordered for the Subway Division of the Interborough Rapid Transit Company are duplicates of more than 325 Equipments which have been in service since 1917.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

25-232

GENERAL ELECTRIC

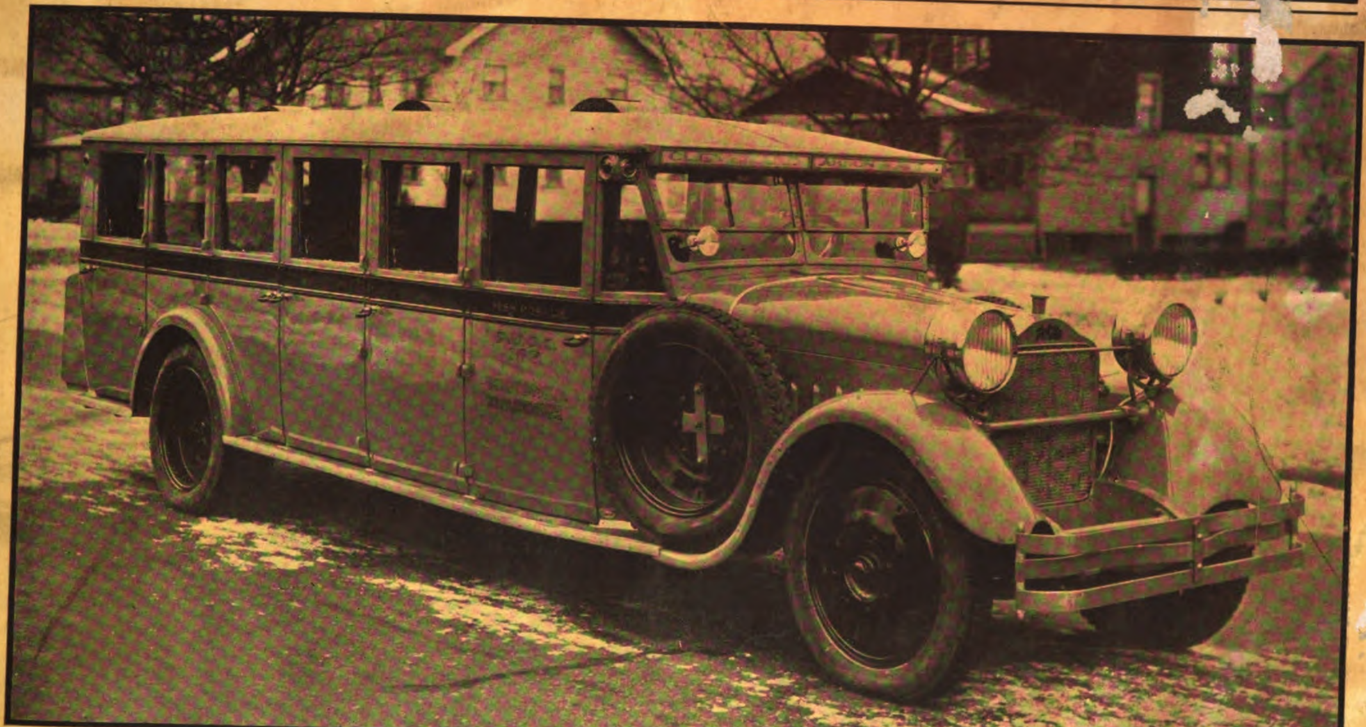
McGraw-Hill Co., Inc.

March 8, 1924

Twenty Cents Per Copy

ELECTRIC RAILWAY JOURNAL

TF
701
.T7



Latest Type of White Model 50-A De Luxe Bus is Extremely Low

340 of the 626 Busses Bought by Railways in 1923 Were Whites

The outstanding preference for White Busses by electric railways, to supplement rail service, is shown by the fact that electric lines during the last year purchased more White Busses than all other makes combined.

According to a survey made by the Electric Railway Journal, electric railway companies bought during 1923 a total of 626 busses, of which 340 were Whites—more than 54 per cent of the total and six times as many as the next greatset number of busses of one make.

The White Company has had many years of experience in building motor bus equipment. More than 5,000 White Busses are now in service.

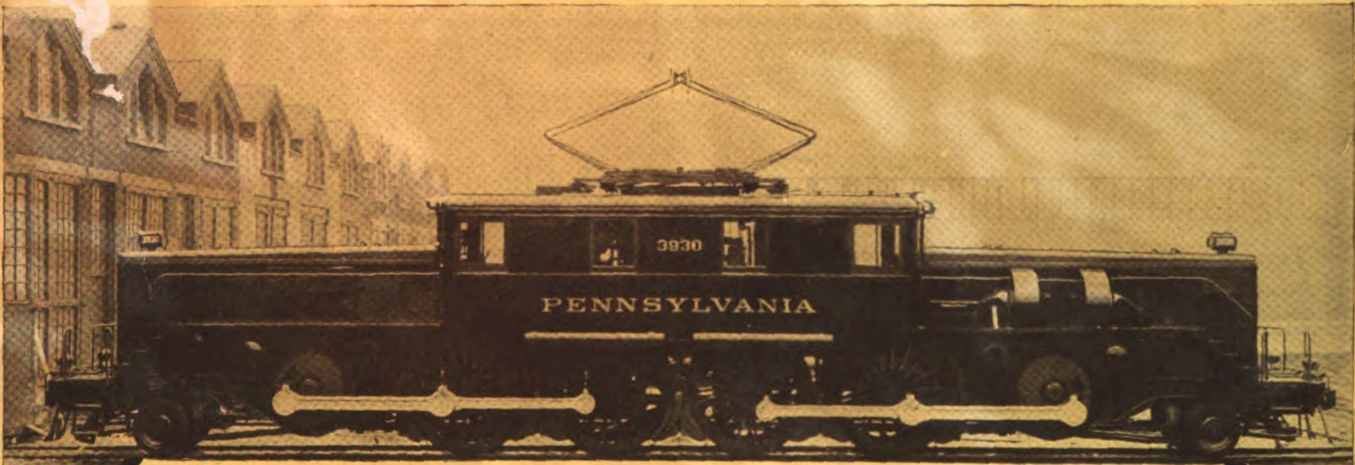
The White Model 50-A de luxe bus represents the latest achievements in chassis engineering skill and body building art. It is extremely low and a marked advancement in design and construction.

White Busses have been adopted by leading bus and railway companies because they meet the most exacting requirements of passenger transportation. Full specifications, delivery dates, etc., on request.

THE WHITE COMPANY, *Cleveland*

WHITE BUSSES

A New Single-Phase Locomotive For The Pennsylvania Railroad



Single-Phase, 3260 Horse-Power Locomotive for Preference-Freight Service on the Pennsylvania Railroad.

This locomotive was on exhibit at the Mid-winter Meeting of the American Institute of Electrical Engineers, in Philadelphia, February 4 to 8.

It has the following distinctive features:

Largest capacity single-phase motors ever built in this country.

New type of flexible gear, with highest duty in locomotive service.

First flexible pinion used on locomotives in the United States.

Oil-insulated, force-cooled transformer.

Automatic oiling system for jackshaft and motor bearings.

One rigid driving-wheel base.

Apparatus mounted directly on engine frame.

Individual blowers for cooling apparatus.

Accessibility for inspection and maintenance.

Availability for either freight or passenger service by simply changing gear ratio.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

Vol. 63, No. 10 New York, March 8, 1924 *Pages* 355-400

ELECTRIC RAILWAY JOURNAL

MORRIS BUCK
Associate Editor
C. W. SQUIER
Associate Editor
JOHN A. MILLER, JR.
Assistant Editor
G. J. MACMURRAY
News Editor

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago
MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago
CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 355

Three-Car Articulated Train for Detroit 357
BY A. C. COLBY.

Traffic and Financing Topics of Midyear Meeting 363
St. Louis gathering one of the largest ever held by American Electric Railway Association, some 750 attending the dinner.

√ **Electric Railways on Firm Basis** 364
BY BRITTON I. BUDD.
The magnitude of the industry, the increasing ratio of annual rides per capita, the improvements being carried out and other features inspire unbounded confidence in the future.

Decentralization a Real Answer to Street Congestion 366
BY HARLAND BARTHOLOMEW.
Efforts must be made to obtain maximum use of street space, to reduce non-essential traffic in congested centers, and to increase street space where essential.

The Business of Government 370
BY ELIOT WADSWORTH.
Business men have direct interest in securing competent administrators of government business, and should act on that.

Traffic Relief in Los Angeles 372
BY GEORGE BAKER ANDERSON.
The traffic problem in this city results from small usable street room. Suggestions for relief cover many new phases.

Suggestions for Relief of Street Congestion 373
BY R. F. KELKER, JR.
Chief causes of congestion in all cities outlined. Prime factor in present congestion is traffic to and from high buildings.

Improving Traffic Conditions in Cleveland 375
BY JOHN J. STANLEY.

Many Committees Hold Meetings at St. Louis 376

The Improving Financial Condition of the Industry 379
This subject, which was the topic at the afternoon session of the St. Louis meeting, was discussed from the viewpoints of the investment banker, the economist and the holding company.

Investment Banker Sees Prospect of Better Financing .. 379
BY J. K. NEWMAN.

Economist Sees New Era Ahead for Electric Railways .. 380
BY RICHARD T. ELY.

Holding Company Sees Progress in the Industry 384
BY B. C. COBB.

Association News and Discussions 387

News of the Industry 389

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."
Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingeniería Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

MEMBER AERA 1924

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.
Copyright, 1924, by McGraw-Hill Company, Inc.
Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

A Complete Picture

IT IS always a pleasure to travel—to visit conventions, to see new places and meet new people. Not every one is necessarily interested by the same things in the places he visits or the things he hears, but a man must be dull indeed if he does not find some pleasure and profit in it. It is, however, difficult for any one man to get a complete picture when events are moving rapidly and a great deal is happening at one time.

Unfortunately, travel is expensive in both time and money. The average man is closely tied down by his business and has few opportunities for extensive journeys. We feel, however, that the ELECTRIC RAILWAY JOURNAL serves the industry as a good substitute for personal trips when it is impossible to spare the time or find the money.

With the purpose of serving you in mind, the editors of this paper were in attendance at the St. Louis Midyear Meeting this week, attending committee meetings, technical sessions and the dinner. Between times they edited copy and wrote reports, the last work of this nature being done on board the train on the return trip.

So a complete story of the meeting is presented to you only a few days after its close. Even though you attended the meeting, this report gives you a perspective and a permanent record impossible to obtain in any other way.

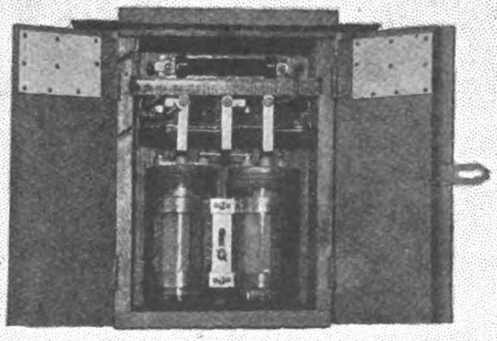
Number of Copies Printed, 6,100

Advertising Index—Alphabetical, 40; Classified, 36, 38; Searchlight Section 35

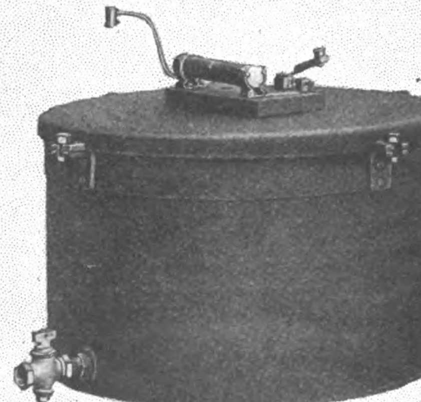
Westinghouse
Railway Lightning Arresters
Meet every requirement for the Car, the Line and the Station

WESTINGHOUSE
M. P.
LIGHTNING ARRESTER

MP Arrester, 100-750 Volts



Type AR Electrolytic Arrester
For Voltages up to 3800



Type A Electrolytic Arrester
For Voltages up to 2500

The MP Arrester is still the standard after 20 years of meritorious service. The 1924 model has an improved housing suitable for either indoor or outdoor mounting on the car, on the pole or in the station. A single design meets all applications.

Type AR Electrolytic Arrester is a direct-current arrester for car or station use. The arrester should be used for each 500 kilowatts of feeder bus, converter or motor-generator capacity.

The arresters are mounted, and securely held in asbestos lined cypress boxes. For mounting beneath the car the boxes have a flat top. For mounting in the station, or on the car roof, or for outdoors, the boxes have a slanting roof.

Type A Electrolytic Arrester has a greater discharge capacity than the AR arrester and is used most extensively in substations. The area of aluminum tray wetted by electrolyte is several times that of any other aluminum-cell arrester. It has the greatest discharge capacity of any direct-current arrester, and is not limited to any particular kilowatt capacity of circuit.

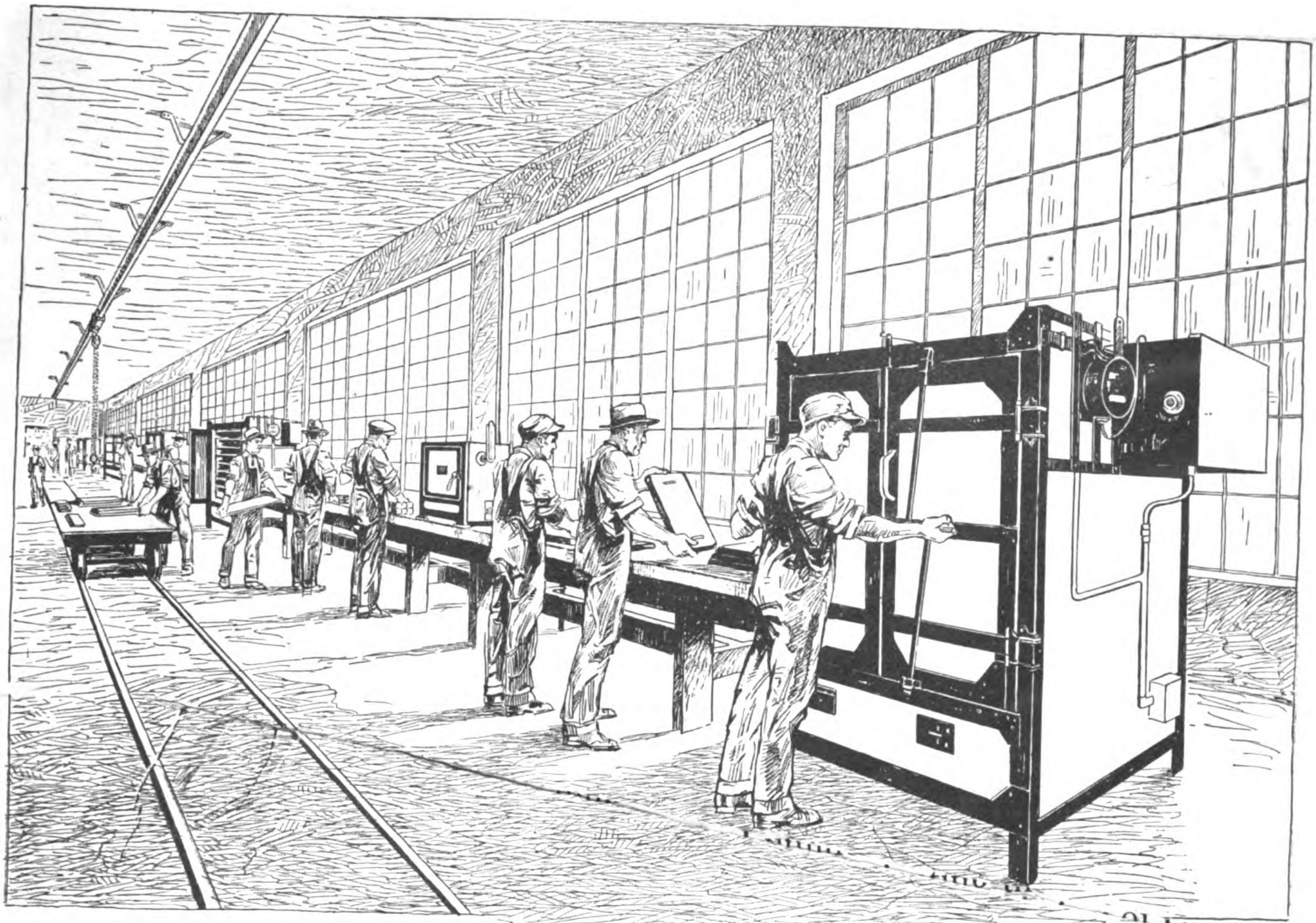
Descriptive Leaflet 20021 and 20022 gives full particulars.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Sales Offices in All Principal Cities of the United States and Foreign Countries

MEMBER ELECTRIC RAILWAY ASSOCIATION AMERICAN AERA

Westinghouse



SIZES
up to
58" x 66" x 36"
High Wide Deep
INSIDE

The Value of Convenience

TYPE K electrically heated ovens, located at convenient intervals along your shop aisles, will save steps and speed up your manufacturing processes. With the temperature quickly raised to the point you desire and automatically maintained there, the TYPE K ELECTRIC OVENS turn out production day-after-day with uniform results—no spoiled work—no attendance.

¶ The Type K oven has all the other virtues you would naturally desire, too. It occupies little space, contributes very little heat to immediate surroundings, minimizes fire hazard and emits no fumes nor odors.

¶ The ease and simplicity of operation of the Type K oven will improve your shop working conditions, and this always means increased production—greater profits.

¶ Our nearest district office will be glad to answer any questions regarding Type K Ovens or to assist you in solving problems of electric heat application.

Write for
Leaflet 1815
Describing These
Ovens

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the
United States and Foreign Countries

W
WESTINGHOUSE
ELECTRIC

Westing

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pennsylvania
Dept. of Publicity
Please send Leaflet 1815

Please Print
Name...
Position...
Address...

F

Mr. Walker also said this:

"Old methods of doing trackwork were apparently satisfactory up to a few years ago, there having been few changes for a number of years. More recently, however, maintenance methods have been much modified by the development of certain types of machinery such as welders, grinders, rail benders, mechanical tampers, etc."

The machinery used by the Eastern Massachusetts Street Railway, of which Mr. Frank B. Walker is Chief Engineer Maintenance of Way, includes 9 Ajax Electric Arc Welders, 24 Universal Grinders and 10 Reciprocating Grinders. With these they rejuvenated 680 miles of track since 1919.

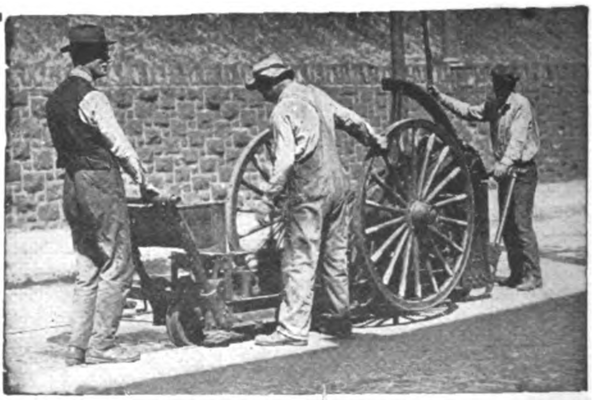
Have you grinders enough? And welders? And the right kind? Our bulletins might help you.

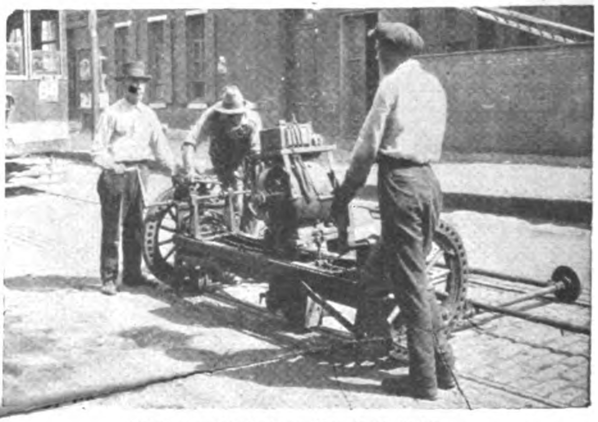
Railway Trackwork Co.

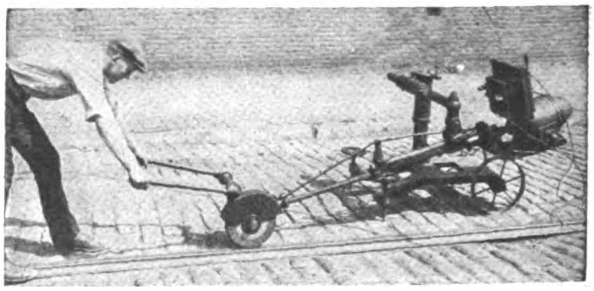
3132-48 East Thompson Street, Philadelphia

AGENTS:

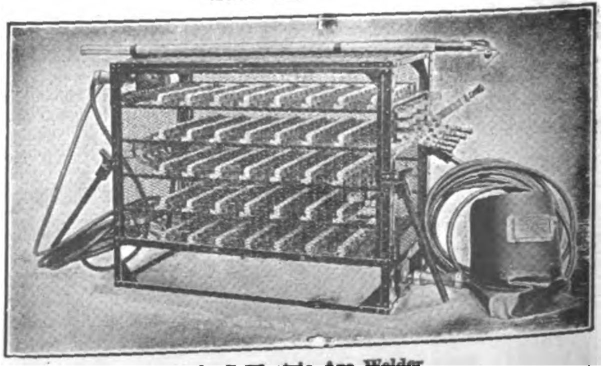
Chester F. Gallor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London


"Reciprocating" Track Grinder


"Universal" Rotary Track Grinder


"Hercules" Rail Grinder

ATLAS RAIL GRINDER
"Atlas" Rail Grinder


"Ajax" Electric Arc Welder

LAA
Luminous Arc

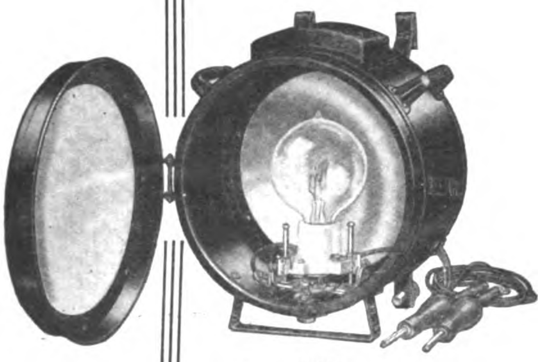
Two Popular Imperial Interurban Types

These two popular Imperial Headlights for interurban service are standards for maximum illumination.

The LAA Luminous Arc throws a high-powered beam, illuminating the track for a sufficient distance for safe stopping of cars traveling sixty miles an hour. It operates efficiently on a wide voltage range.

The DCP Incandescent, for lines with constant voltage, is comparable to the arc for illumination.

Full specifications in Headlight Catalog No. 210.
Be sure you have a copy on file.



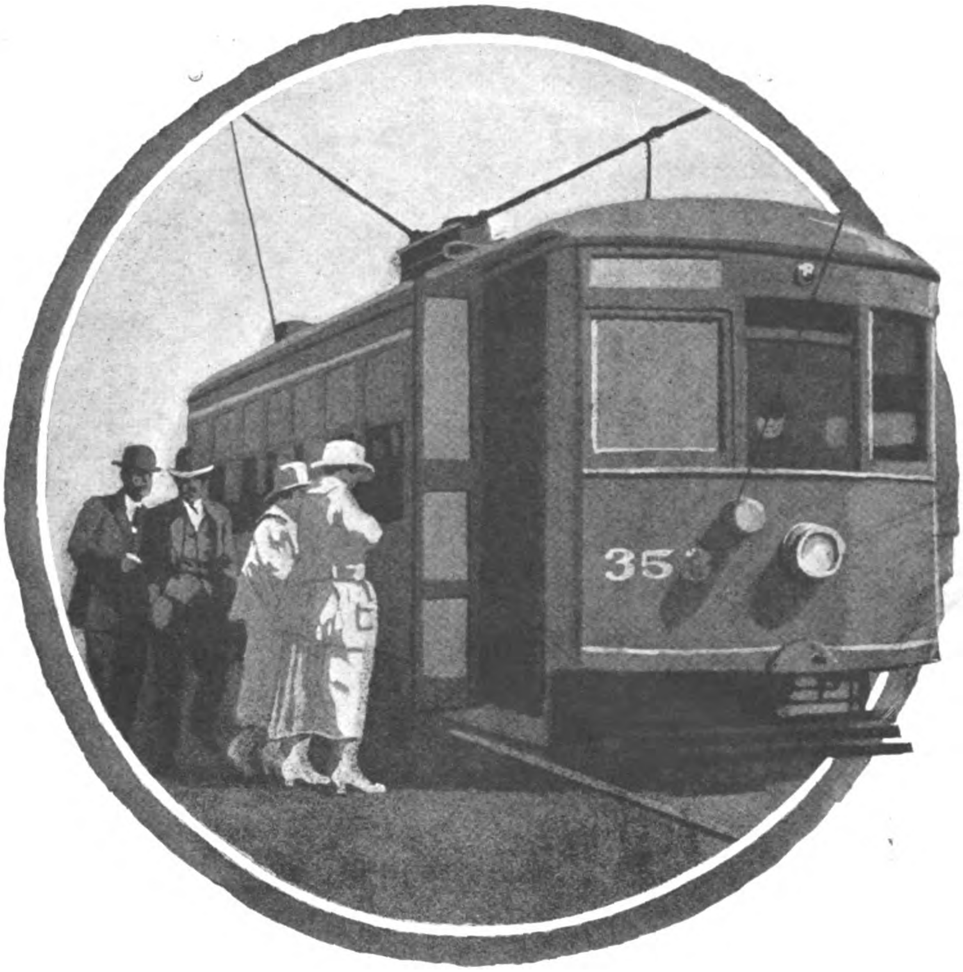
DCP
Incandescent

Sold exclusively by

THE OHIO BRASS CO.
Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE



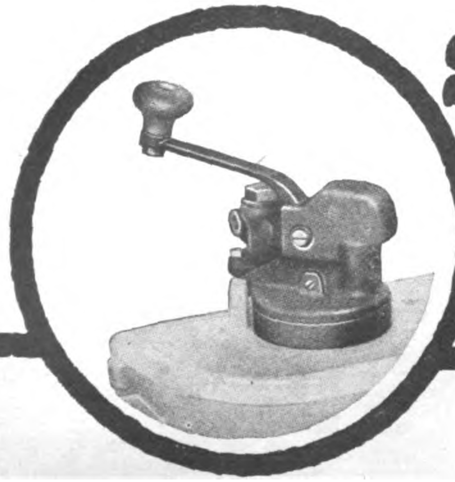
When you see a Safety Car, think of us—

We have been pioneers in Safety Car development since the first Safety Car was built.

Our special "safety features" ushered in the era of successful one-man operation and brought about many of the economies which are recognized as characteristic of this now widely-popular form of service.

Cars now in service with our equipment number nearly 10,000. They are of all types and sizes, some old and some new, but all *Safety Cars* because they are fitted for one-man operation. When you see a Safety Car, think of us.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH



Steel Twin Tie Track

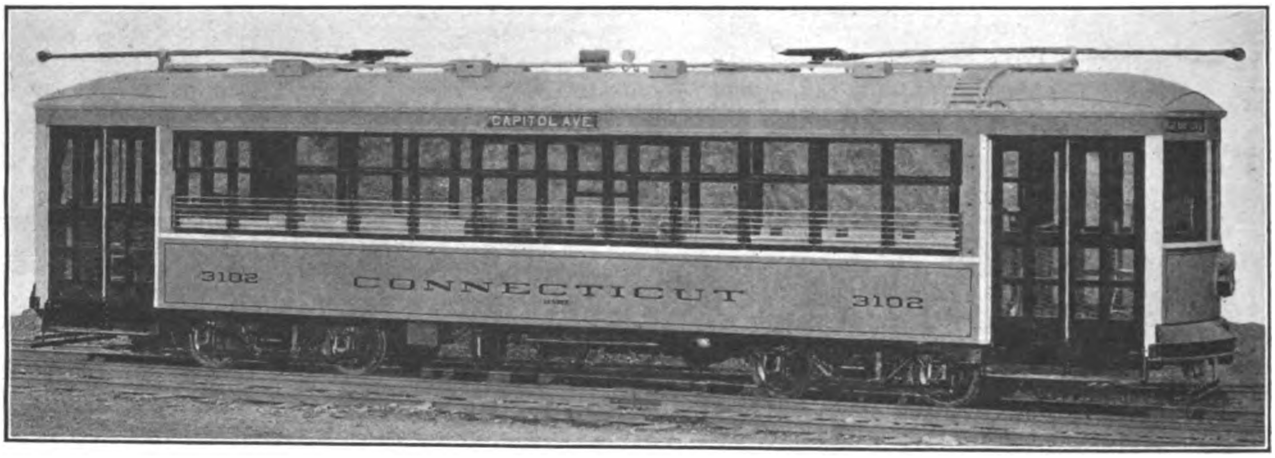
TRACK MUST WEAR
But
Must ALL of it
WEAR OUT?

In your 1924 paved track construction plan for wear on rail and paving and plan against *"wear-out"* of your foundations and ties.

Steel Twin Tie Track meets these requirements at an initial cost that is often far below the cost of usual designs. The large effective bearing of the Twin Tie plates provides a support on which rails may wear naturally while the effective bearing of the concrete foundation on the subgrade supports the paving. Then, at the end of a long life of the wearing parts, the renewal does not affect the foundation at all.

The complete details are at your disposal in our proposal folder which will include delivered prices on Twin Ties.

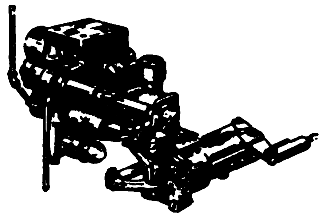
The International Steel Tie Co.
Cleveland, Ohio



Fifty cars of the type above, recently placed in service on the lines of the Connecticut Co., are equipped with the Variable Load Brake.

Greater Safety; Higher Mileage!

these with the VARIABLE LOAD BRAKE



THE VARIABLE LOAD BRAKE

The Westinghouse Variable Load Brake has been developed to solve the problem of controlling cars under widely varying load conditions. It is an attachment which may be added to any straight air or semi-automatic equipment whereby the braking force is automatically adjusted to suit the weight on the car, by regulating the brake cylinder pressure as the weight changes.

The adjusting mechanism is thrown into engagement by the opening of the car doors. While the doors are open, passengers are leaving and entering the car, and when the doors are closed again, the condition of loading will be that under which brake operation will take place for the next stop, or a slow-down, as the occasion may demand.

The use of the Brake insures stopping within a uniform distance regardless of whether the car is empty or loaded.

Higher daily car mileage in busy territory increases revenue.

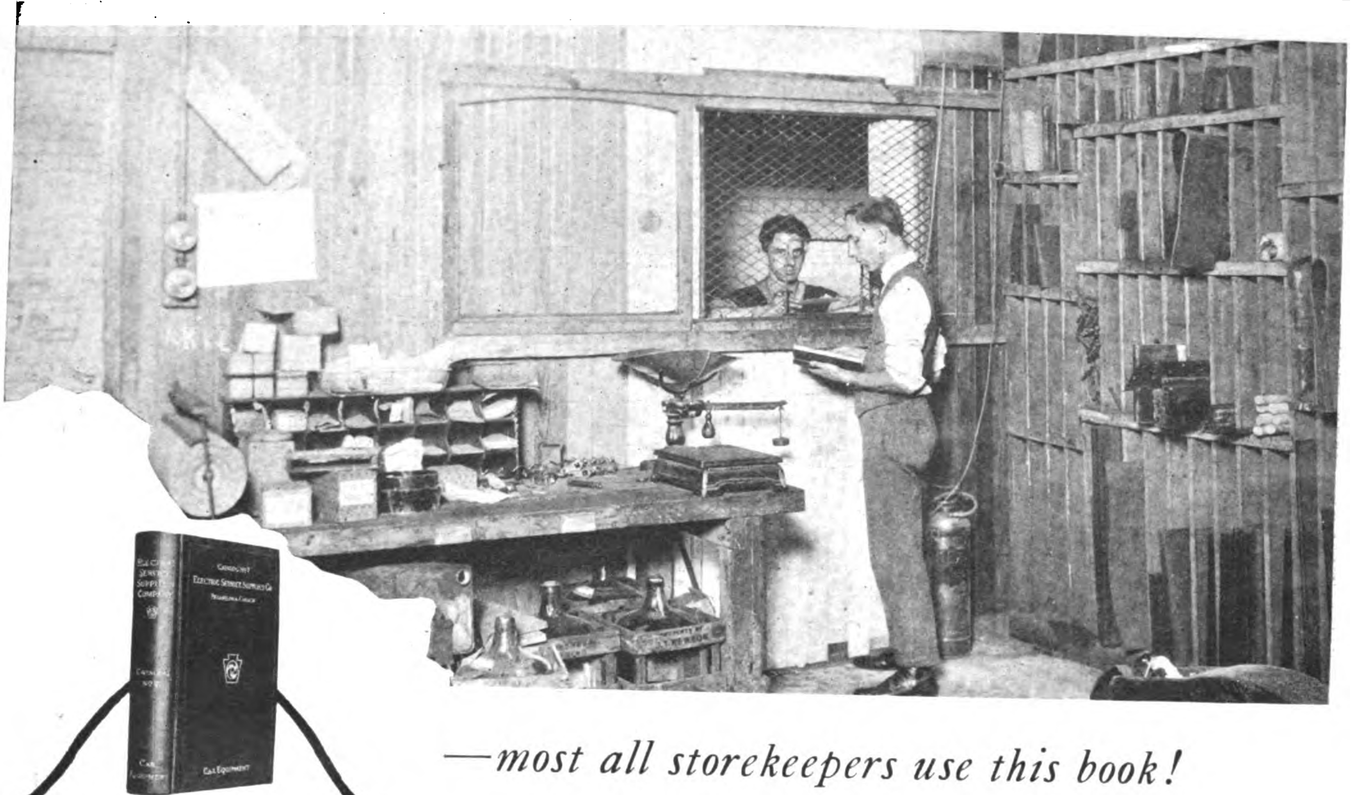
The Variable Load Brake helps to increase mileage by reducing the time ordinarily required for stopping, and by making it safe and feasible to operate at peak speed for longer periods from one stop to the next.

The cardinal feature of the Variable Load Brake is that it stops a loaded car in as short a distance as an empty one. It does not slow up schedules during hours of heavy traffic, just when the greatest possible hauling capacity is needed most.

Send for Publication T-2045

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works: WILMERDING, PA.

WESTINGHOUSE TRACTION BRAKES



—most all storekeepers use this book!

Some Sample Items

- Steel Gear Cases
- Motormen's Seats
- Lighting Fixtures
- Headlight Resistances
- Air Sanders
- Trolley Catchers
- Shelby Trolley Poles
- Rotary Gongs
- International Fare Registers
- Fare Register Fittings
- Samson Cordage
- Air Valves
- Cord Connectors
- Trailer Connectors
- Automatic Door Signals
- Standard Trolley Harps
- Standard Trolley Wheels
- Segur Coil Winding Tools
- Peerless Armature Machines
- Insulating Materials
- Aetna Commutator Stones
- Sand Driers
- Peerless Pinion Pullers
- Employees' Badges
- Line Material
- Portable Lamp Guards

It's the ESSCO CATALOG No. 7

A veritable gold mine of information for the man who has to handle, use, install or purchase car and shop equipment. Countless illustrations, big, clear, instructive. Hundreds of pages of descriptions, dimensions, ratings, capacities.

There are suggestions in this book, for the man who does some thinking about his job. It will help him to keep *up-to-date* on the maintenance of the modern car. The complete index alone, is a valuable feature.

Do you use your copy?

ELECTRIC SERVICE SUPPLIES CO.

PHILADELPHIA
17th and Cambria Sts.
PITTSBURGH
829 Oliver Building

NEW YORK
50 Church St.
SCRANTON
316 N. Washington Ave.

CHICAGO
Monadnock Bldg.
BOSTON
88 Broad St.

Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver

Millions are available to modernize maintenance work

Identify yourself with the electric railway industry through representation in the

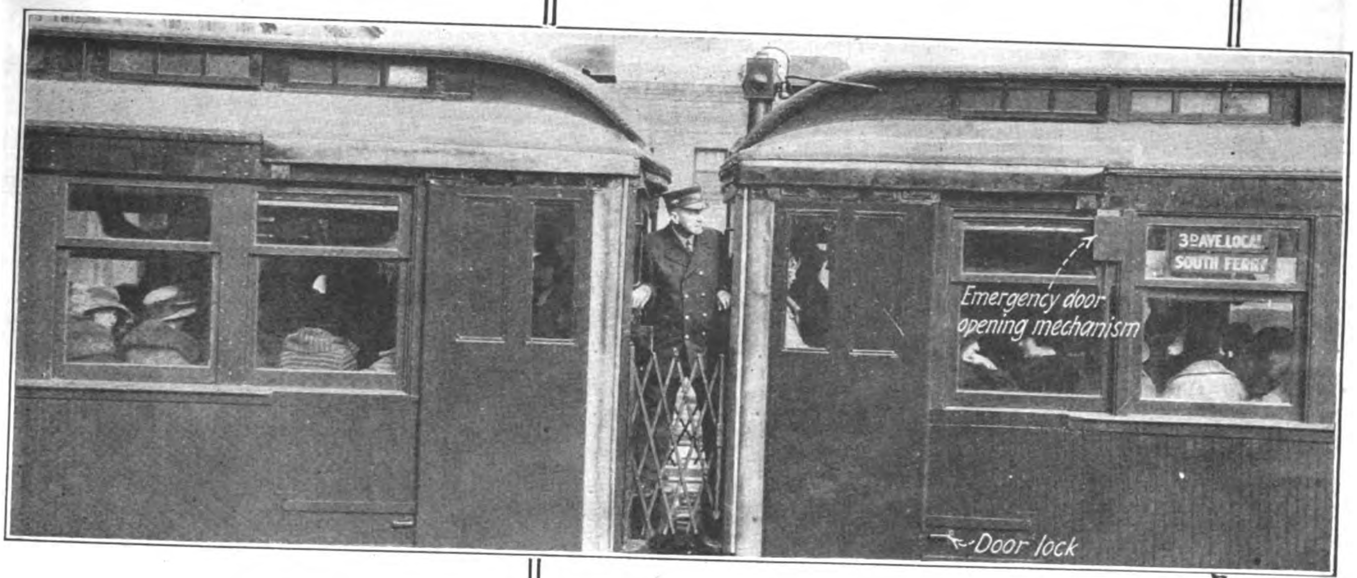
Annual Maintenance Number

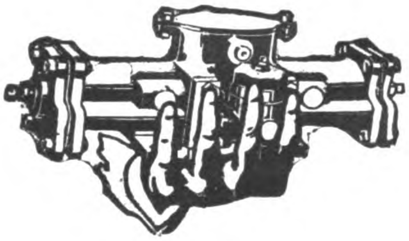
(Dated March 22, 1924)

depended upon by an entire industry for the latest and best in all phases of maintenance practice and equipment.

Last forms close March 17. Write or wire your reservation today.

Electric Railway Journal
Tenth Ave. & 36th St.
New York City





NATIONAL PNEUMATIC EQUIPMENT

DOOR ENGINES

DOOR AND STEP CONTROL

OPERATING MECHANISMS

MOTORMAN'S SIGNAL LIGHTS

Greater safety for "the safest railroad in the World"

National Pneumatic Equipment has long been a feature of New York's great transportation systems. Now the elevated cars are to be remodelled with closed vestibules and electro-pneumatically controlled doors — National Pneumatic equipped.

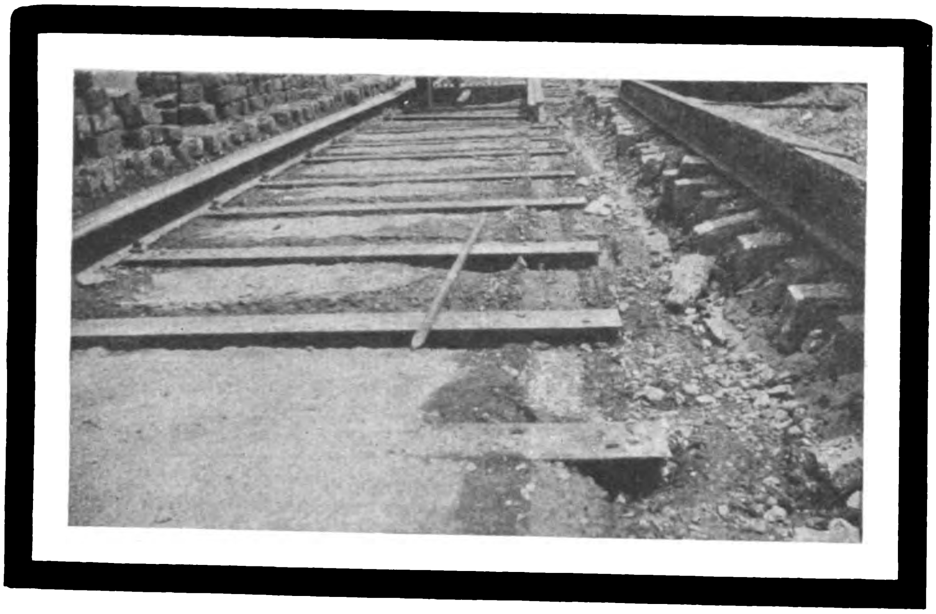
Just another instance of how experienced and progressive operators are turning more and more from costly, inefficient, unsafe, hand methods.

Ask us for details.

NATIONAL PNEUMATIC
DOOR and STEP CONTROL

National Pneumatic Co., Inc.
Originators and Manufacturers
***Principal Office:* 50 Church St., New York**

Philadelphia—Colonial Trust Bldg. Chicago—McCormick Bldg.
Works—Rahway, New Jersey
Manufactured in Canada by
Dominion Wheel & Foundries, Ltd., Toronto, Ont.



Carnegie Steel Cross Ties in Cincinnati

In 1912, Carnegie Steel Cross Ties were laid in the Gilbert Avenue Viaduct in Cincinnati. These ties were embedded in concrete and the viaduct was opened for service on December 25, 1912.

1923—eleven years later—it was found necessary to repair the viaduct. A thorough investigation was made of the trackbed, ties and rails at which time it was decided that new rails and fastenings only would be necessary. The concrete foundation and steel ties were in good condition.

The picture shown above was taken immediately after the rail had been removed and therefore displays the surface of the ties under the rail—without having been touched in any way. The engineer in charge stated that the ties were in almost perfect condition—with apparently no corrosion—no wear under the rails and looked good for twenty or thirty years more of service.

This stretch of track is down grade and subject to as severe conditions and heavy traffic as possible in this city.

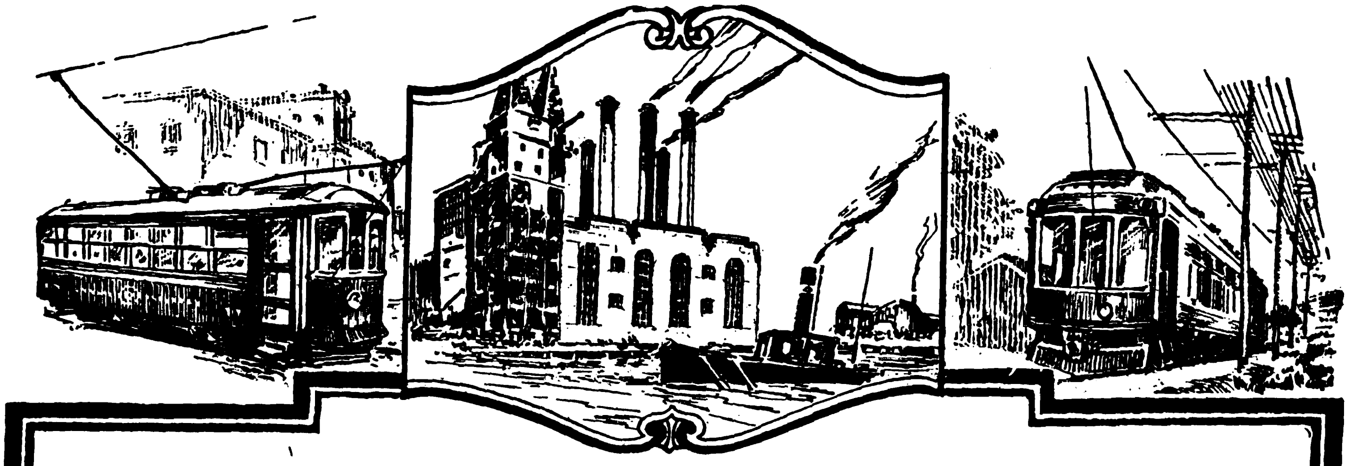
Booklet—"Steel Cross Ties"—on request.

Looks us up at the Colliseum
Spaces '51-1/2 and 52, March 10th to 13th

Carnegie Steel Company

GENERAL OFFICES: CARNEGIE BUILDING 434 FIFTH AVENUE PITTSBURGH, PA.

1682



A little line of type with a big meaning for you:

"There is a Texaco Lubricant for every purpose"

At the foot of most of our advertisements we say:
"There is a Texaco Lubricant for every purpose."
Now that is not merely an Advertising Slogan.
Nor is it just "another happy phrase."
It is a statement of Fact.
And it is a fact that means much to you.

If you are using TEXACO Lubricants on your Road, you know that you are getting the right lubricants for your present equipment and that you can and will get the right lubricant for any new or additional equipment installed on your Road.

If you haven't come to TEXACO yet, you will come all the more eagerly when you know that each and every lubricating need will be surely and completely satisfied.

And that means that you will get a carefully tested lubricant for every piece of mechanism, on the Rolling Stock, in the Power Plant, along the Roadway and on the Motor Equipment.

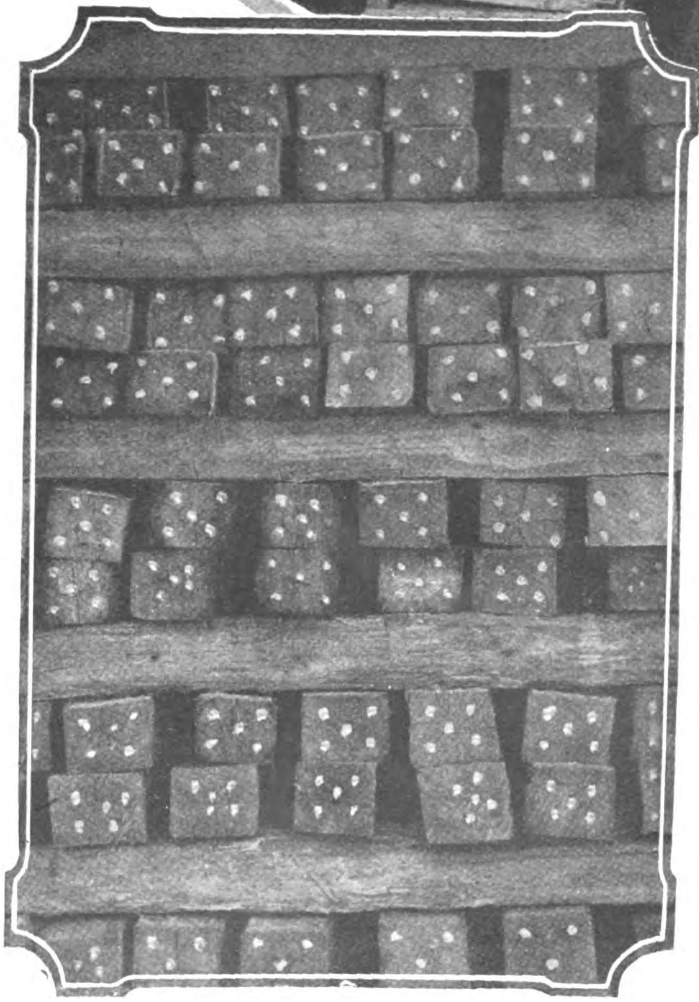
To list all the places where TEXACO will help will be merely like publishing your Mechanical Inventory—for that "every" means *everything* on your Road.

And TEXACO goes even further, for TEXACO is supplying Burning Oils, Kerosene, Gasoline, to the Street Railways of the country.

And remember this—that all TEXACO Products are sold at a fair price, delivered promptly from our stations all over the country, and they are introduced and accompanied by TEXACO Engineering Service.

No wonder TEXACO leads in the Street Railway field. Mechanical Officials on Street Railways, aggregating hundreds of millions of car miles a year, agree that they never knew what Service was till they *took up with* TEXACO.

We are large, we are growing, we are busy. But we are neither too big nor too busy to take on for 1924 and thereafter a number of Roads who want to secure the most for their money in the way of Petroleum Products and Service.



When You Purchase *International* Ties You Meet Tie Value Face to Face

THE decided advantage of buying ***International*** Ties is that you can actually see definite assurances of quality and value.

You can examine every tie — each one is properly graded and plainly marked. You can measure them one by one to convince yourself that they are all graded in strict accordance with the standard tie specifications. Furthermore, the ties are permanently marked with our dating nail — our guarantee of grade and quality to prove to you that ***International*** Ties are sound, full size, strictly graded, properly seasoned and thoroughly treated.

The entire ***International*** organization works conscientiously and in harmony to manufacture the best, and the best only, in the tie field. Thus is ***International*** quality safeguarded and perpetuated.

Contract NOW with International and save time, trouble and expense.

The International Dating Nail

Our guarantee of quality is your protection

International Creosoting & Construction Co.
General Office—Galveston, Texas
Plants: Texarkana, Texas Beaumont, Texas Galveston, Texas

International

LUBRICATION, like mechanics, is governed by definitely established principles. On the extent of their observance will depend the results attained.

Good lubrication can never be secured with inferior or unsuitable oils. It cannot be maintained without the installation and conformance with correct practices.

Galena Oils and Service provide a trustworthy, ever-reliable combination that assures the placing of your lubrication standard on an efficient and economical basis—a combination that has been endorsed by the O.K. of hundreds of electric railways.

Through its ability to effect savings in time, labor, depreciation and repairs the actual cost of Galena lubrication is much lower than that of ordinary refinery lubricants. It is beyond comparison in service results.

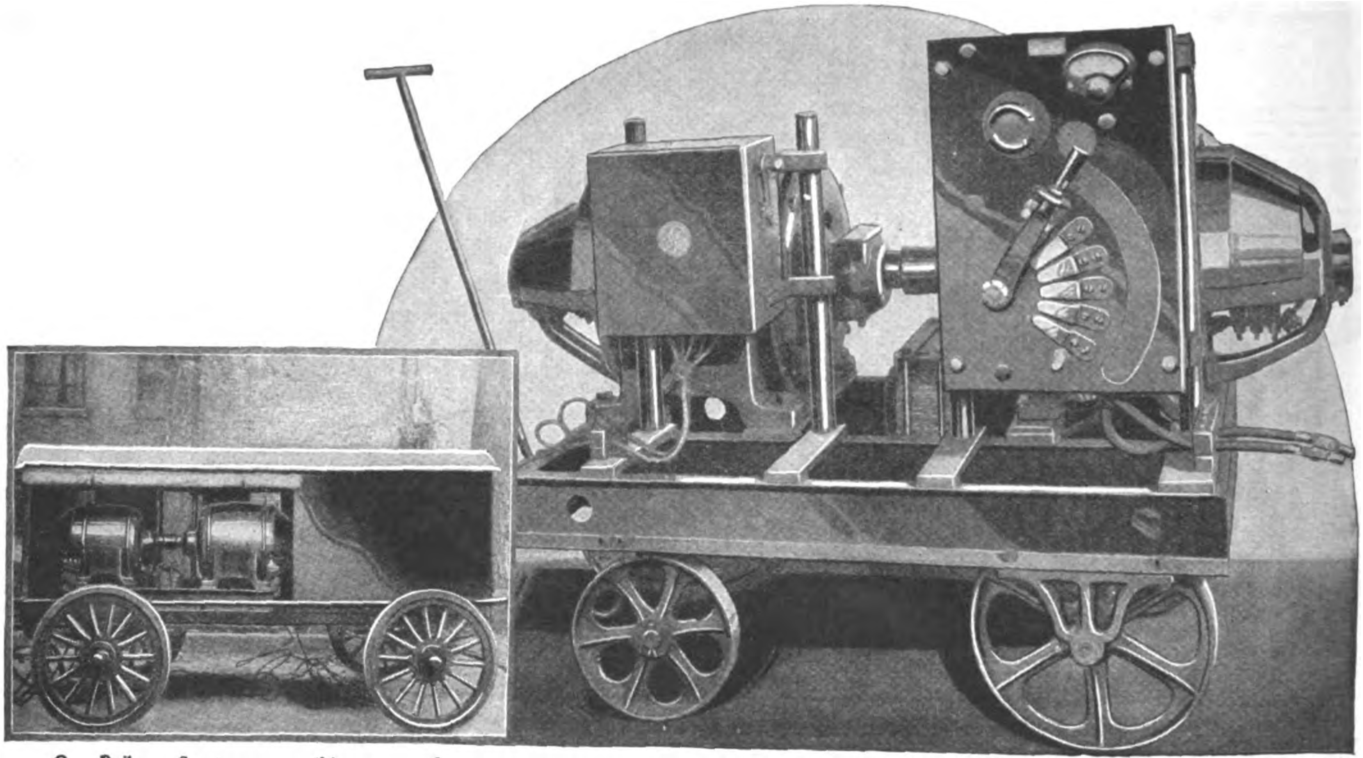
QUALITY - SERVICE - ECONOMY - GALENA OILS

Galena-Signal Oil Company

New York Franklin, Pa. Chicago

and offices in principal cities

Here's the Arc Welder for You



One Railway Company uses this means of mounting "WD-9" for track work.

Representative Users

Eastern Mass. Street Railway
Manchester Street Railway
Schenectady Railway Co.
Philadelphia Rapid Transit
American Rys. Co., Philadelphia
Washington Ry. & Elec. Co.
Northern Ohio Pr. & Lt. Co.
Columbus Rwy. Lt. & Power Co.
Chicago Surface Lines
Milwaukee Elec. Ry. & Lt. Co.
Des Moines City Railway Co.
Ottumwa Rwy. & Lt. Co.
New Orleans Rwy. & Lt. Co.
Texas Elec. Rwy. Co., Dallas
San Francisco—Oakland Terminal

"WD-9" does great shop and track work!

"WD-9" was specially designed to run at constant speed where the supply circuit varies even as much as 400 volts minimum or 650 volts maximum. It gives the operator constant conditions in the arc—and that means good welding. It is a compact, well-built set—easy to use and economical to operate.

Here are some of the things "WD-9" will do right for you if you team it up with a welding operator who knows his business. It repairs truck frames—brake hangers—journal boxes—gear cases—resistors—drawheads and underframing—flanges on worn car wheels—worn journals on armature shafts—broken and worn motor frames. It readily repairs railway tracks—and is used for rail bonding.

Get acquainted with "WD-9" at any of the G-E Sales Offices which are in all large cities.

General Electric Company
Schenectady, N. Y.

GENERAL ELECTRIC

New York, March 8, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Company, Inc.
HENRY W. BLAKE and HARRY L. BROWN, *Editors*

Volume 63
Number 10

St. Louis Meeting Shows Industry Improving

THE local men, under the chairmanship of W. H. Sawyer, who looked after the arrangements for the Midyear Meeting and dinner at St. Louis on March 4 are to be congratulated for their part in the success of the gathering. No pains were spared in working out detail plans to meet every wish of the delegates. To them also goes a large part of the credit for bringing together so large an attendance. The business meetings were well attended, and places were set for 769 at the banquet. A good spirit of optimism prevailed, and one could sense among railway men a widening feeling of certainty as to the course to be taken in the future and confidence in the ultimate results. The days of floundering and uncertainty and poor management are rapidly passing, and the condition of the industry reflects it. And naturally there is a happier air at the conventions, for gloom has been dispelled. All that is needed now is much hard work, for the course is charted and the way is clear.

Traffic Relief Work Given Impetus at the Midyear Meeting

PROBABLY the most profitable session of the St. Louis Midyear Meeting was that devoted to the discussion of street congestion and the means of bringing relief. The subject was treated from a viewpoint much broader than the direct interest of the electric railway, for any substantial measure of relief can come only through effort directed toward considerations many of which are quite apart from the direct operation of the railway. In fact, the problem is so broad in its scope and the railway man's interest is so important that he will in future have to take a very active part in city planning work if he fulfills his obligations to the car riders and his company.

The papers and discussion on the subject presented at St. Louis and printed elsewhere in this issue bring out nearly every angle of the problem and offer many suggestions for relief. Not all of these are in agreement. But there was unanimity of opinion that parking in downtown streets must be totally prohibited. Parking is not only one of the worst causes of congestion and there is the least justification for it of any of the causes, but its elimination is the most readily available measure of relief. At present we are making a very improvident use of streets, as their entire width should be devoted to the use of moving vehicles and not in large part for storage which benefits the few while penalizing the great majority.

There was also agreement that the height of buildings in business districts should be restricted in order to avoid further overloading of the street space. This would tend to bring about decentralization, and unless this is accomplished cities will strangle themselves in business development. While decentralization is certainly desirable from a traffic standpoint, none of the speakers mentioned the economic advantage of the concentrated business district in the general transaction of business. This is the reason, of course, for concentration. But it is rapidly reaching the point in most of our larger cities where street congestion is becoming the controlling consideration.

Decentralization is actually taking place already. The logical decentralization plan is to move business out by trades and centralize by trades in separate sections. This process has been going on in some cities, notably New York, and a desirable feature of this is that it not only relieves congestion and makes possible faster street car operation but it means more off-peak riding and better spreading of the peak riding over the railway system.

Parking abolition and building height limitation were considered the primary steps to be taken. They should precede the building of subways, double-deck streets, elevated and depressed sidewalks, etc., which tend to pyramid the problems both physically and financially.

To emphasize again the importance of railway men taking part in the broad planning for relief of street congestion, it may be said that while they are only indirectly interested in some of the planning, they will directly profit or suffer by the success or failure of the broad relief plan considered as a whole. The St. Louis session has undoubtedly served to give the study of relief measures a great impetus among railway men.

Be Sure to Have the Right Picture on the Screen

WHO has not seen the discomfiture of a lecturer who was illustrating his talk by lantern slides when he suddenly turned around and discovered that the picture on the screen was not the one he had been talking about? This is similar to a pitfall into which some unwary electric railways occasionally stumble.

It is undoubtedly desirable for the railways to give the widest possible publicity in their various communities to the improvements being made in their equipment and to the quality of service they are rendering. But in so doing care must be exercised to avoid attracting the attention of the public to conditions which in reality are not as described—boasting about something that isn't so.

An instance can be cited where a railway was spending considerable sums of money for publicity to tell the public what was being done to make the service convenient and attractive. Yet on the same day that the company was "boasting" of the quality of its service it happened that a package-express car was dispatched from one terminal of an important interurban line immediately ahead of a limited passenger car. The package-express car was heavily loaded and was unable to maintain a high speed. It dragged along in front of the limited and caused the latter to reach its destination five minutes late. As a result several passengers missed a railroad connection.

"So this is what the traction company calls giving service," remarked an irate passenger.

Such an occurrence goes to show the importance of accuracy in publicity work. Be sure the right picture is on the screen. Get the standard of service up first, then tell the public about it. And keep telling the public about it, for this tends to keep the men on their toes to live up to the advertising. It works both ways.

Detroit's Articulated Train Is a Progressive Experiment

DETROIT'S new articulated train, described in this issue, is a good example of a type of pioneering valuable to the electric railway industry. This train incorporates in its design a number of ingenious construction features and represents a unique development in rolling stock. The officials of the Department of Street Railways of Detroit, together with the manufacturers, are to be congratulated on their vision and courage in having a unit of this much-talked-of type built so that its practicability may be determined.

Now that the first unit has been placed in operation, one is naturally led to consider both the advantages and limitations of this type of vehicle for city street service. Its size makes a permanently coupled train of this type suitable for only the heaviest traffic conditions. On only a limited number of streets in only the largest cities are such traffic conditions found outside rush hours.

In Detroit there are several unusual factors that appear to favor such a unit. These include the practice of staggering industrial hours and the peculiar features of Woodward Avenue traffic. This street is unusual in that there are three distinct heavy loads per day from the Highland Park plant of the Ford Motor Company, in addition to the ordinary morning and evening downtown business district load. In most other cities, even on streets that have unusually heavy traffic, economical operation of so large a unit during the rush hours would result in objectionably long headways.

Although a considerable saving in weight, first cost and operating cost is shown for the articulated train by the figures compiled in the Detroit analysis, it is too early at this time to know whether the unusual conditions on Woodward Avenue are such as to make the articulated three-car train suitable for all-day service. From the fact that the calculations in the article are based on utilizing the existing type of motor-trailer trains to carry the base schedule, it may be assumed that there is some question as to whether, even on this unusual street, the new articulated train is not too large for other than just "tripper" service. If this is the case, the analysis of costs, to give a true picture of the whole problem, should also include in favor of multiple-unit equipment the economies to be derived by the use of equipment adapted to all-day operation, thus retiring the older and less efficient equipment to rush-hour operation only. On the principle of putting one's best foot forward, there is also to be considered the favorable effect on the public of having the most modern and best-looking equipment in service throughout the day, and operating the more or less obsolete looking equipment only when required in rush hours.

Articulated Unit May Have Field on Interurbans

THE previous editorial outlines the principal limitations of the articulated train in city service. It would seem that we cannot look for a widespread use of this type of equipment in such operation. It may be, however, that the articulated train can be advantageously used in interurban service. A feature of the train which was particularly noticeable in the run made under its own power from Cincinnati to Detroit was its excellent riding quality. This characteristic was the subject of much favorable comment by many of the sixty railway men who made the trip. As pointed out by Mr. Colby, in the article in this issue, the result is attributable to the elimination of overhang at the adjacent ends of the connected cars. In view of this feature, such a unit might be used in high-speed service, and it makes for a substantial saving in weight as compared to ordinary cars in trains.

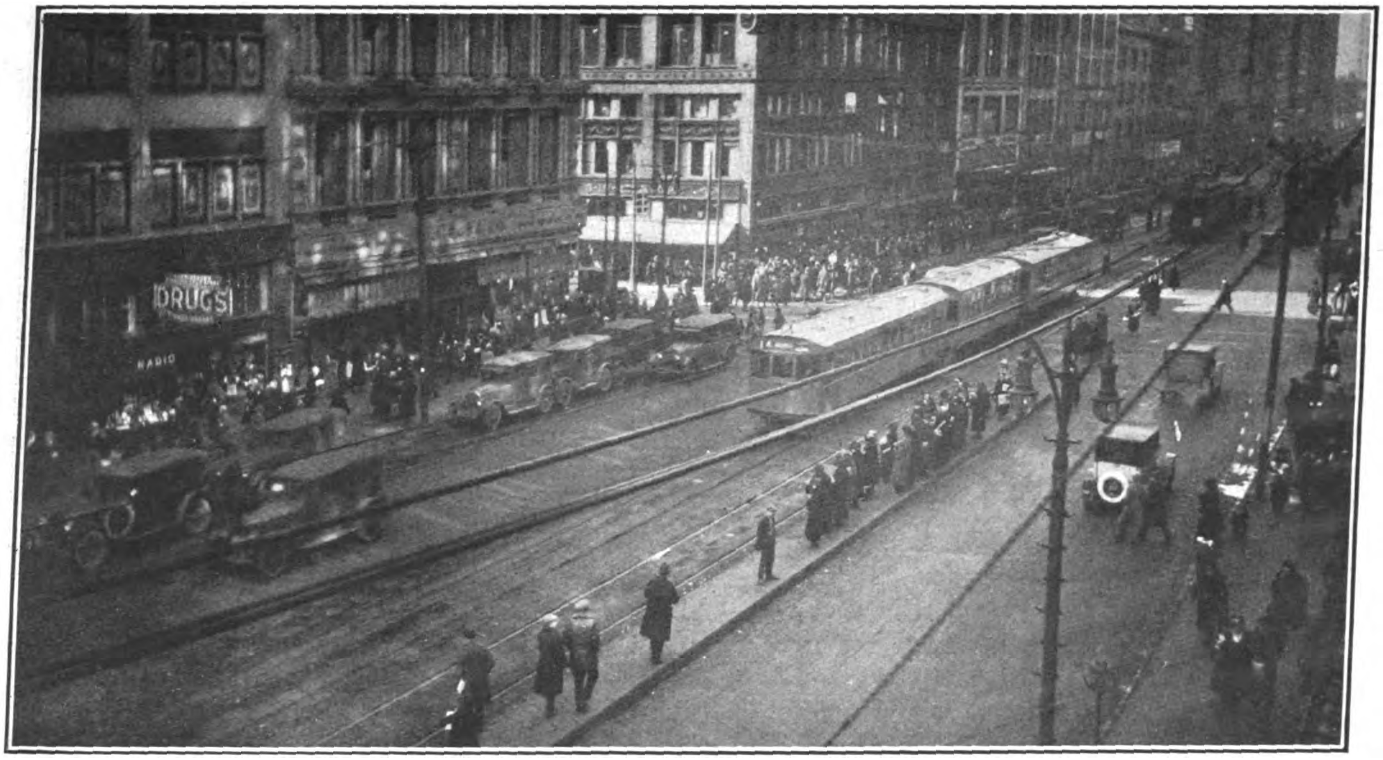
In addition to the improved riding qualities, the new vestibule design gives a satisfactory construction for affording safe communication between cars on roads having curves of comparatively short radius. This was of particular interest to the interurban men who made the trip, because of the possibility for equipping a unit of this type to give a combined coach, diner and parlor car service.

The Annual Blast in Washington

NEARLY every year the local electric railways in the District of Columbia are subjected to a legislative lacing. Civic affairs there are under the supervision of a committee of Congress, and the legislators, convened from all sections of the country, appear to take special delight in picking upon the railways. In years past they have found fault with the service. They have urged the consolidation of the principal operating companies, just as if the controlling interests in the properties were not astute enough voluntarily to bring about such a consolidation if a basis equitable to both could be found. Last year they sought elimination of one-man operation of cars. Now, the legislators want fares reduced to 5 cents. To accomplish this, they would abolish the local utilities commission.

It matters nothing to the legislators that the facts with respect to the local companies are all contained in their annual statements and in the reports and accounts of the operations of the companies made by the Public Utilities Commission. As politicians the legislators are more interested in factors than they are in facts. In politics, whatever is done must be done while the tom-toms beat. Even the dabbler in civic affairs knows that the public often accepts semblance for the substance.

Of course the members of the committee would deny that their intent is destructive, but about the only things that the committee does by such agitations is to destroy the confidence of the public in the local public service commission, affect the credit of the railways by causing an unwarranted degree of anxiety among the holders of the securities of the companies, and prevent the officers of the companies from functioning to their best ability by dissipating in no inconsiderable measure energies that might better be directed to constructive effort, and would be so directed if the members of the committee would only look upon the railway business as they do upon their own private business.



The Train Was Placed in Service on Woodward Avenue the Day After It Arrived from Cincinnati Under Its Own Power

Three-Car Articulated Train for Detroit

Many Unusual Features of Design Are Incorporated in This Initial Unit —The Seating Capacity Is 140 Passengers—Articulated Construction Reduces Weight and Cost and Also Gives Improved Riding Qualities

By A. C. Colby
Superintendent of Equipment, Department of Street Railways,
City of Detroit

THE Department of Street Railways, City of Detroit, has recently placed in operation on the Woodward Avenue line a three-car articulated unit designed to handle the passenger traffic on this extremely heavy route. This unit, built by the Cincinnati Car Company and equipped by the General Electric Company, is the first three-car articulated unit placed in service in this country and the first electrically propelled unit of this kind to be placed in operation in the world.

The decision to purchase and operate a trial unit of this type was based on a careful study to determine the most economical means of handling the increasing traffic on the Woodward Avenue line. Nearly two years ago the officials of the Department of Street Railways, realizing that the growth of traffic would require some modifications in the car equipment on the heavier routes, made a thorough investigation of the rolling stock available for mass transportation.

The Woodward Avenue line, which carries nearly 43,000,000 passengers annually and is now operated with motor-car trail-car trains on sixty-second headway during rush hours, was selected as typical of the heavier routes in Detroit. Studies were made on the basis of furnishing off-peak service with motor-car trail-car trains as at present and supplementing this service during rush hour periods with (1) additional motor-car trail-car trains; (2) three-car multiple-unit trains; (3) three-car articulated trains.

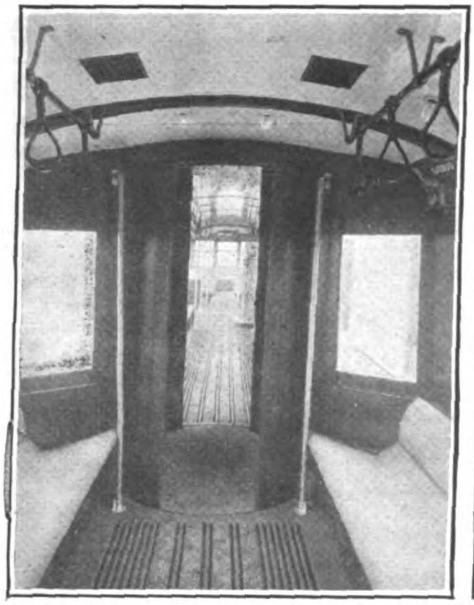
RUSH-HOUR EQUIPMENT COMPARED

Weights and seating capacity of the equipment considered for the rush-hour service are given in Table I.

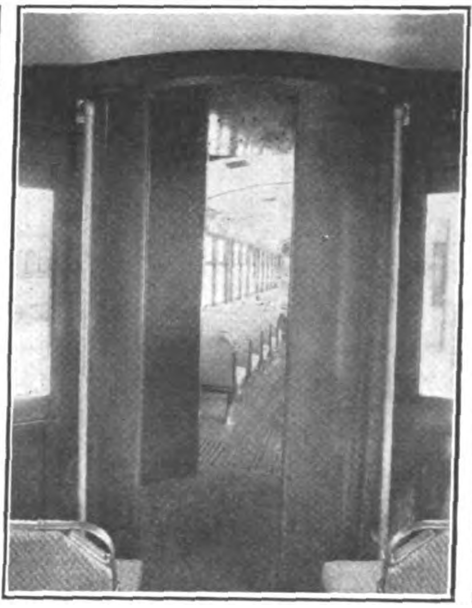
TABLE I—WEIGHTS AND SEATING CAPACITY OF EQUIPMENT CONSIDERED FOR RUSH-HOUR SERVICE

	Present Motor Car and Single-Deck Trailer	Proposed Three-Car Multiple-Unit Train	Proposed Three-Car Articulated Train
Weight complete, train less load, pounds	74,000	120,000	75,000
Weight, motor car, less load, pounds....	47,000	40,000	......
Weight, motor car, seated, pounds......	54,000	47,000	......
Weight, trail car, less load, pounds.....	27,000	. . .	......
Weight, trail car, seated load, pounds...	34,850		
Weight, train, loaded (seated) pounds ..	88,850	141,000	94,600
Weight, train, loaded (standing) pounds.	103,400	162,000	114,200
Seating capacity....................	106	150	140
Pounds per seat..........................	700	800	536

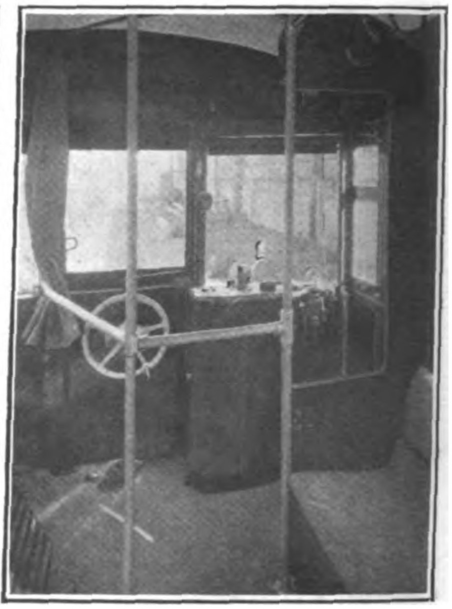
It was estimated that to handle successfully the rush-hour traffic the carrying capacity should be increased 12,000 passengers per hour over that provided during the non-rush hours. The comparison shown in Table II on page 360 was made on the basis of continuing the present off-peak service with motor-car trail-car trains



Interior View from Middle Car Toward Rear End Shows Position of Connecting Vestibule on Straight Track



A Full Connecting Opening Is Obtained Through the Vestibule, Even When the Train Is on a Curve



Motorman Located Right-Hand Corner of Leading Car. Brake Valve Piping Inclosed in Dash to Give More Knee Room

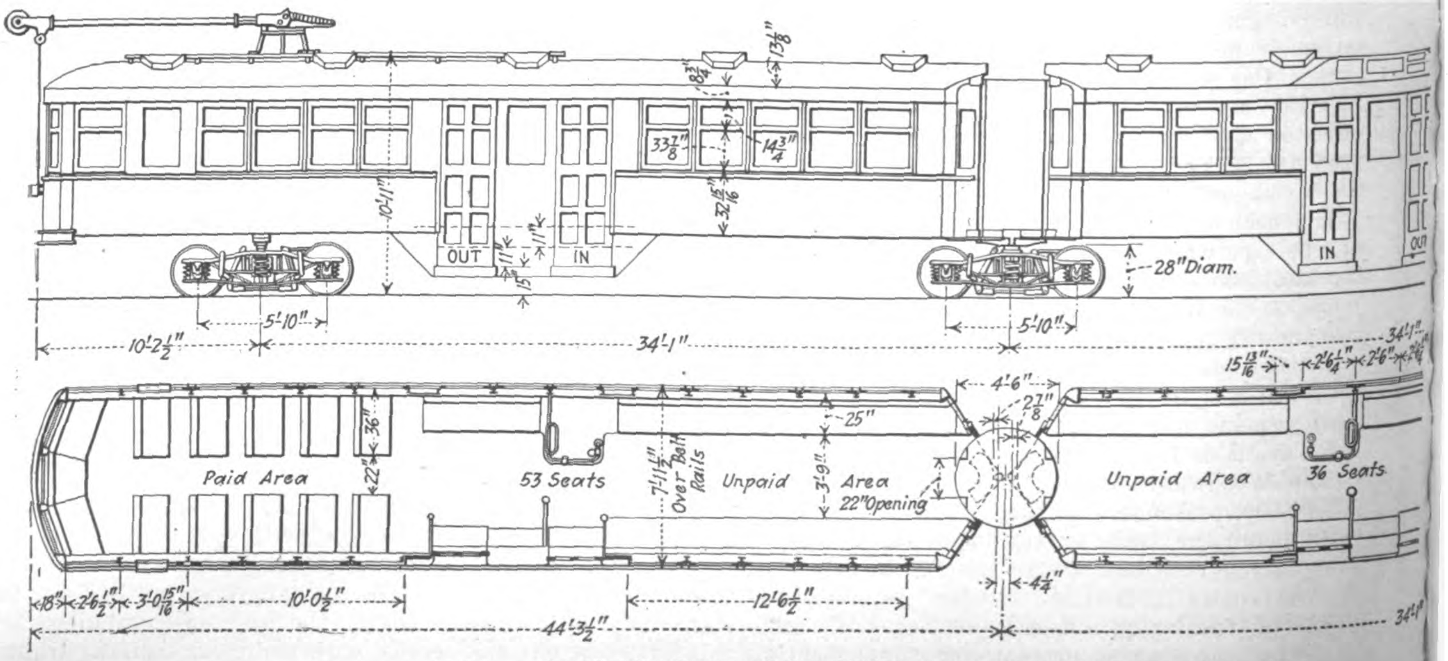
and adding additional service during rush hours to provide an additional carrying capacity of 12,000 passengers per hour, making a total carrying capacity during peak service of 16,200 passengers per hour.

The total expense for each type of equipment, including both fixed charges and operating costs, is given in Table III on page 360.

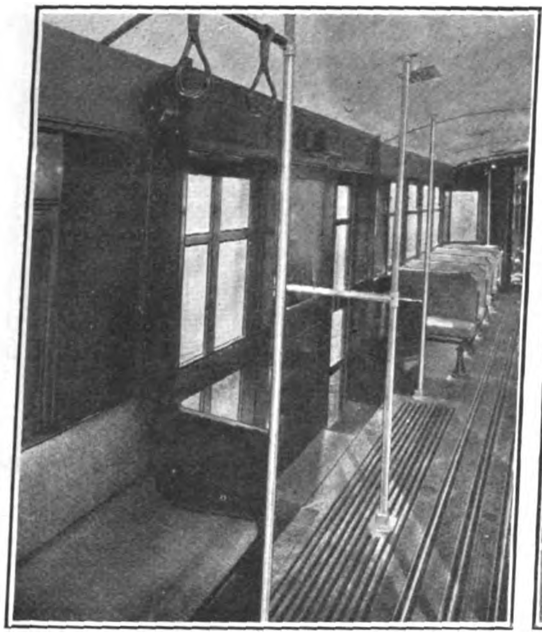
It is evident from this comparison that the three-car articulated train for the peak service shows lower operating costs, lower first cost and lower total annual charges than the other types of equipment considered. In addition to the advantages of lower weight, lower operating costs, and lower first costs for the articulated unit, the latter has the additional advantage of better riding qualities and, due to the available passageway between cars, it lends itself to a reduction in platform labor.

The improved riding obtained with this type of equipment is due to the fact that there is no overhang of the bodies beyond the trucks, adjacent ends of each body being carried on a center bearing on the truck bolster. When entering curves and passing over crossings, the greatest lateral movement on ordinary cars is at the ends overhanging the trucks. In an articulated train of this type there is no overhang at the adjoining car ends. Cars coupled in trains in the ordinary manner are subjected to lateral movement and have a tendency to roll on account of the oscillation transmitted back and forth between the different cars. In the articulated train this does not happen. Although each body is perfectly free to adapt itself to any curve or irregularity in track, there is no tendency to transmit rolling from car to car. In fact, there is a dampening action through the side bearings on the connecting vestibules which tends to check any rolling which may occur.

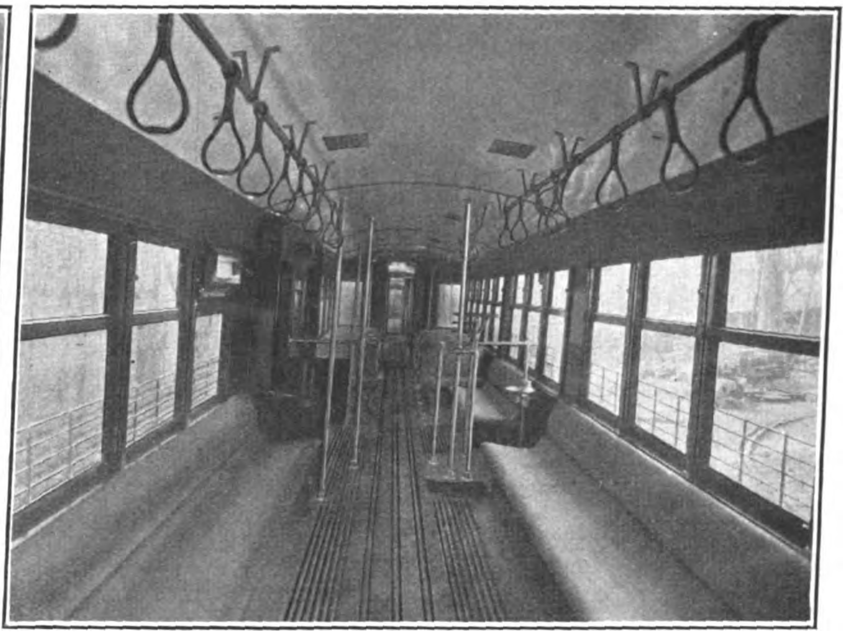
In analyzing the operating costs given in Table III, no consideration was given to a possible reduction in



Combination Cross and Longitudinal Seating Gives a Total Seat Capacity



Stanchions Are Made of 1-In. Aluminum Pipe



Conductor's Position Is Opposite the Center Door

the platform labor by using the articulated unit. It was considered that the platform charges would remain the same for this as well as the multiple-unit train.

The train is composed of three center-entrance, center-exit, light-weight type car bodies mounted on four trucks. It is arranged for single-end operation. The general floor plan and elevation are shown in the accompanying drawings. The inside trucks are mounted at the junction and under the vestibule between the first and second, and the second and third car bodies, and are trailer trucks. The two outside trucks mounted under the front end of No. 1 body and the rear end of No. 3 body are motor trucks, each equipped with two GE-275, 60-hp. motors.

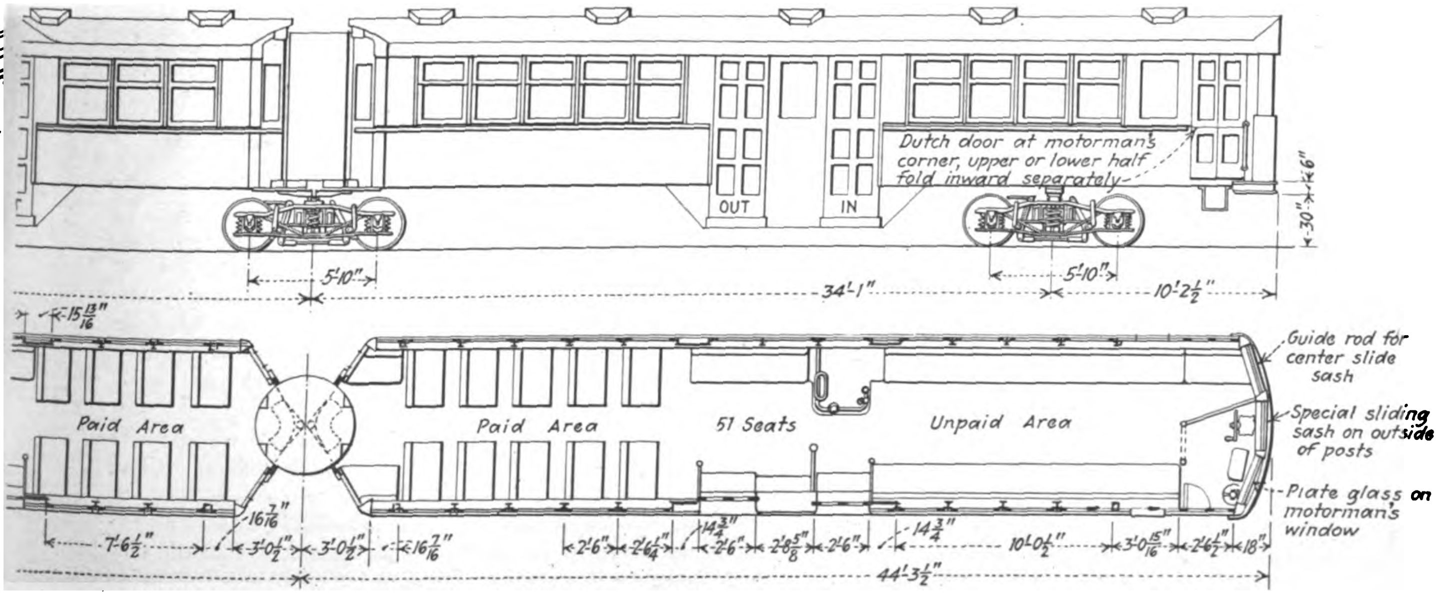
All four trucks are of a special passenger type arch-bar design with large helical springs mounted between the ends of the elliptics and with long helical springs carried in sockets cast on the sides of the journal boxes. They were built by the Cincinnati Car Company and have a wheelbase of 5 ft. 10 in., with 3¾-in. x 7-in. journals. The wheels are rolled steel of 28 in. diameter. The trucks are located so that there is a uniform spacing of 34 ft. 1 in. between their centers.

Distribution of the load on the four trucks is shown in the following table:

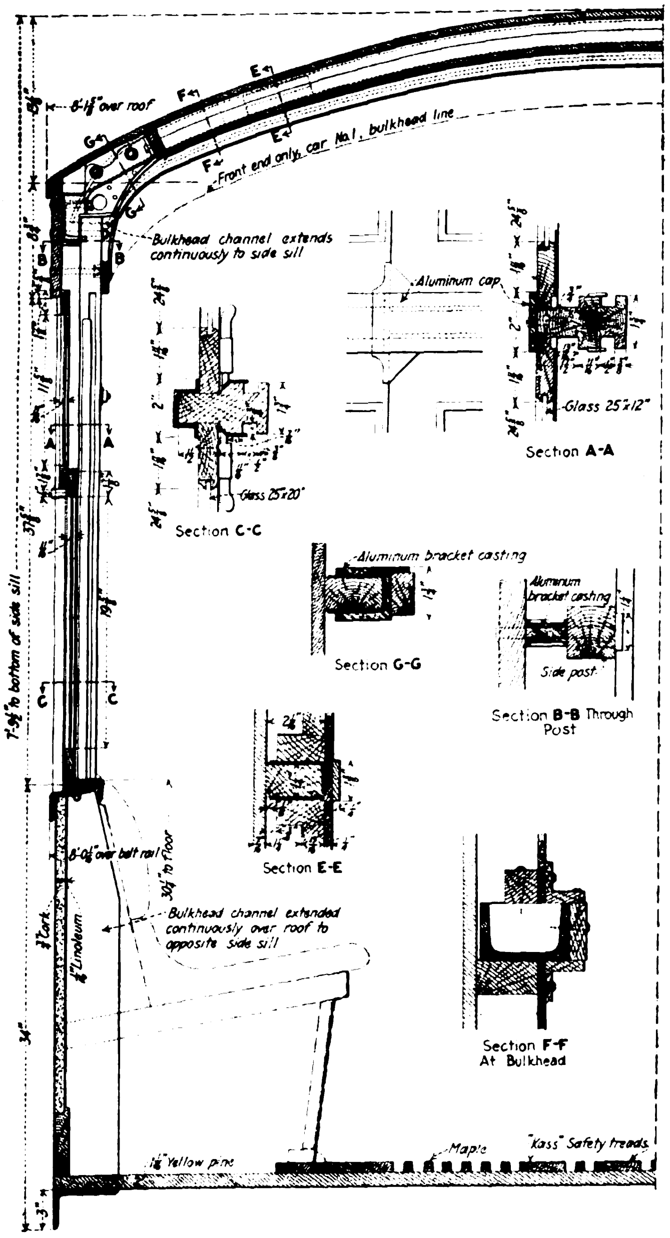
DISTRIBUTION OF LOAD ON TRUCKS

	No. 1	No. 2	No. 3	No. 4
Load on center bearing, pounds	11,155	11,595	10,595	9,355
Weight of truck, pounds	5,725	5,425	5,425	5,725
Weight of motor, pounds	5,000	......	......	5,000
Load on rail, pounds	21,880	17,020	16,020	20,080

From this tabulation it is noted that 41,960 lb. or 56 per cent of the total weight when light is on the driving wheels. This provides a rate of acceleration with a loaded train of 1.5 m.p.h.p.s. with 16 per cent coefficient of adhesion, which is sufficient to insure good acceleration under almost any rail conditions.


Dutch door at motorman's corner, upper or lower half fold inward separately
OUT
IN
30"
6"
5'10"
5'10"
34'1"
10'2½"
15 13/16"
Guide rod for center slide sash
Paid Area
Paid Area
51 Seats
Unpaid Area
Special sliding sash on outside of posts
Plate glass on motorman's window
16 7/16"
7'6½"
3'0½"
3'0½"
16 7/16"
2'6"
2'6¼"
14¾"
2'6"
2'8⅝"
2'6"
14¾"
10'0½"
3'0 15/16"
2'6½"
18"
44'3½"

of 140. Train Is Manned in the Congested Period by Four Men



Cross-Section of Car Illustrates Use of Short Side Posts and Elimination of Top Plate

The general dimensions of each of the three cars comprising the new articulated unit are given in Table IV on this page.

The ends of the center car and the adjoining ends of the two end cars are supported on a special type of center bearing on each of the connecting trucks. The 5-in. x 3-in. x ⅜-in. side-sill angles are carried around the ends of each of these bodies and extend continuously around the entire body framing except at the side door openings, where they are fastened to the steel box piers which act as vertical compression members to reinforce the framing at the opening. Two pairs of diagonal channels of 3-in., 5.15-lb. material further reinforce the end framing, and the entire structure is tied together and stiffened by a No. 12 gage steel plate, 3 ft. 4½ in. wide.

To the end of this body framing is bolted a substantial steel casting, designed with a projecting nose that is carried directly in a cup in the truck center bearing. The adjoining body ends are each carried in a separate cup. The arrangement has a slight theoretical disadvantage in that the point of wearing is not at the true center of the truck, but this is overcome by allowing a slight additional clearance between the edge of the vestibule and the edge of the body flooring where it is cut out to allow rotation in going around a curve. This design of center bearing avoids carrying one bearing on top of the other and consequently does not require the lower bearing to carry the load of both cars with consequent more rapid wear.

Another feature of the center bearing which was given careful attention is that of lubrication. The parts are retained in place by a horizontal bolt passing through two ears on the lower bearing. This bolt extends between the projecting body noses. When the bolt is in place, a projecting shoulder on each nose prevents the nose from coming out of the socket, and at the same

TABLE II—COMPARATIVE DATA ON THE THREE METHODS CONSIDERED FOR INCREASING SERVICE

	Motor Car and Single-Deck Trail Car, Both Average and Rush	Motor Car and Trail Car in Average Service and Three-Car Multiple-Unit in Rush	Motor Car and Trail Car in Average Service and Three-Car Articulated Train in Rush
Headway, average service, seconds.	180	180	180
Headway, rush service, seconds.....	47	60	57
Units required for average service...	32	32	32
Additional units for rush service.....	91	64	71
Total units required..............	123	96	104
Seats per hour in regular service.....	2,100	2,100	2,100
Carrying capacity, rush service:			
Motor-trail car units..............	4,200	4,200	4,200
Additional units............	12,100	12,000	12,000
Total of line......	16,300	16,200	16,200
Annual Car-miles:			
Motor trailer.	59,000	59,000	59,000
Rush-hour units...	22,000	22,000	22,000
Operating costs, cents per car-mile:			
Motor trailer.	31.2	31.2	31.2
Rush-hour units...	31.2	43.8	37.4
Annual operating costs per train:			
Motor trailer.	$18,400	$18,400	$18,400
Rush-hour units....	6,860	9,650	8,228
Total annual operating costs based on number units required:			
Motor trailer, average service. ...	$590,000	$590,000	$590,000
Rush-hour units..........	625,000	620,000	584,188
Total..........................	$1,215,000	$1,210,000	$1,174,188

TABLE III—COST OF OPERATING UNDER THE DIFFERENT METHODS

	Motor Car and Single-Deck Trai. Car, Both Average and Rush	Motor Car and Trail Car in Average Service and Three-Car Multiple-Unit in Rush	Motor Car and Trail Car in Average Service and Three-Car Articulated Train in Rush
Expenditure for rush-hour units:			
Ninety-one motor trailer trains at $23,000..................	$2,093,000	....	....
192 multiple-unit cars at $15,000 ...	....	$2,880,000	....
Seventy-one 3-car articulated trains at $25,000..............	....	....	$1,775,000
Fixed charges at 13 per cent.......	272,000	374,000	231,000
Total annual operating costs and fixed charges....................	1,487,000	1,584,000	1,405,188

TABLE IV—GENERAL DIMENSIONS OF EACH CAR IN THREE-CAR UNIT

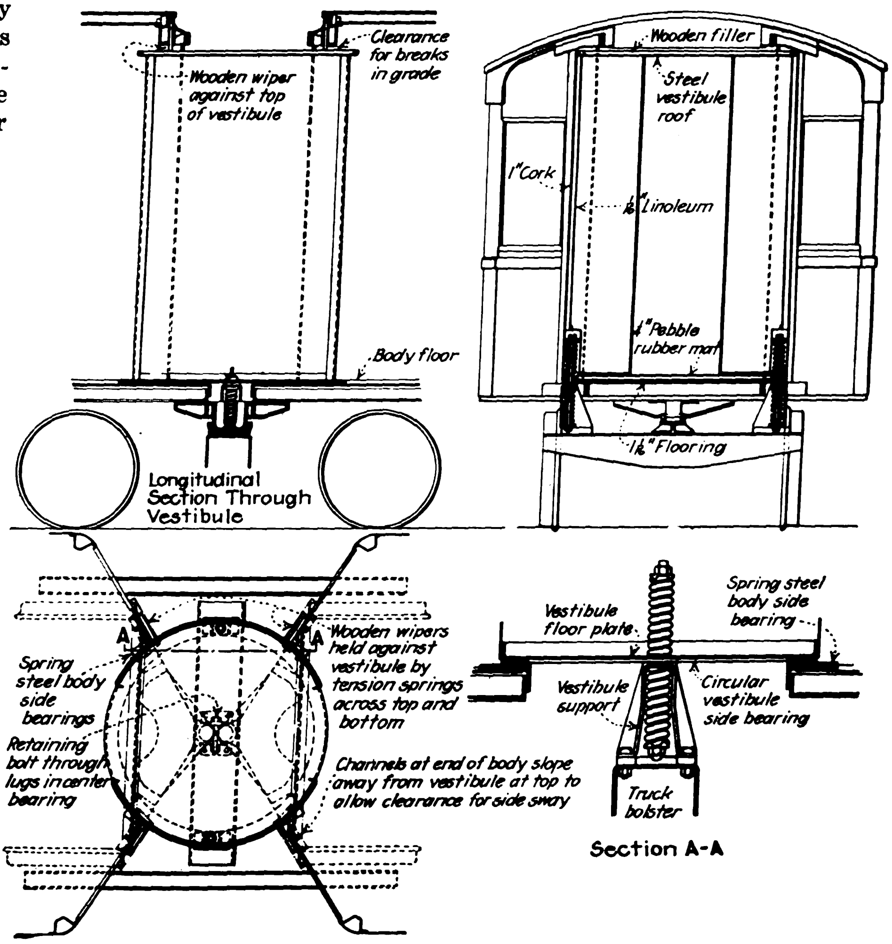
General Dimensions	Car No. 1	Car No. 2	Car No. 3
Length over all..................	43 ft. 10½ in.	33 ft 3 in.	43 ft. 10½ in.
Length over dash................	42 ft. 8 in.	31 ft. 2 in.	42 ft. 8 in.
Length over body..............	37 ft. 3 in.	28 ft. 0 in.	37 ft. 3 in.
Rail to top of trolley boards........	10 ft. 11 in.	10 ft. 11 in.	10 ft. 11 in.
Rail to underside of sill..........	33 in.	33 in.	33 in.
Extreme width..................	8 ft. 2 in.	8 ft. 2 in.	8 ft. 2 in.
Width at side sill.............	7 ft. 11 in.	7 ft. 11 in.	7 ft. 11 in.
Rail to first step..............	15 in.	15 in.	15 in.
First step to second step..........	11 in.	11 in.	11 in.
Second step to platform floor	11 in.	11 in.	11 in.
Door openings (center entrance)....	30 in.	30 in.	30 in.
Door openings (motorman's door)..	30 in.	30 in.	30 in.
Door openings (vestibules between cars)........	22 in.	22 in.	22 in.
Diameter of vestibules..........	4 ft. 6 in.	4 ft. 6 in.	4 ft. 6 in.
Window post centers..........	30 in.	30 in.	30 in.
Truck centers..................	34 ft. 1 in.	34 ft. 1 in.	34 ft. 1 in.
Wheelbase.....................	5 ft. 10 in.	5 ft. 10 in.	5 ft. 10 in.
Size of wheels..................	28 in.	28 in.	28 in.
Width of longitudinal seats (side wall over edge of cushion)........	25 in.	25 in.	25 in.
Distance between seat cushions	45 in.	45 in.	45 in.
Seating capacity..............	51	36	53
Total length of train (over buffers).		122 ft. 8 in.	
Total seating capacity of train....		140	
Radius of shortest curve—inside track		35 ft. 0 in.	

time allows free pivotal motion in any direction. In this way, no bolt holes are required in the sockets, and retention of oil is assured. Each body nose casting is cored out to form a chamber for oil and waste packing.

BOTTOM OF VESTIBULE FORMS SIDE BEARINGS

The bottom frame of each vestibule is reinforced with a substantial steel ring extending completely around its circumference. This ring is fastened to built-up side supports on the truck bolster by long bolts passing through compression springs above and below, and provided with shims or washers for adjustment. Thus each vestibule is supported entirely on the truck and simply extends into the opening between the posts at the end of each adjoining body. The vestibule floor ring extends above and rests upon the body framing, and the body floor is cut out in an arc so that each body is free to swing on its center bearing, while the vestibule remains stationary relative to the truck.

As the body tends to roll from side to side due to track inequalities, a flat steel rub piece on each side of the framing comes in contact with the steel ring under the vestibule and forms a side bearing. The load is transmitted through the vestibule ring to the spring supports on the truck which resist the rolling and tend to dampen it. In effect, therefore, the side bearings in this construction are up against the bottom of the vestibule rather than down against truck supports, as in the usual design.

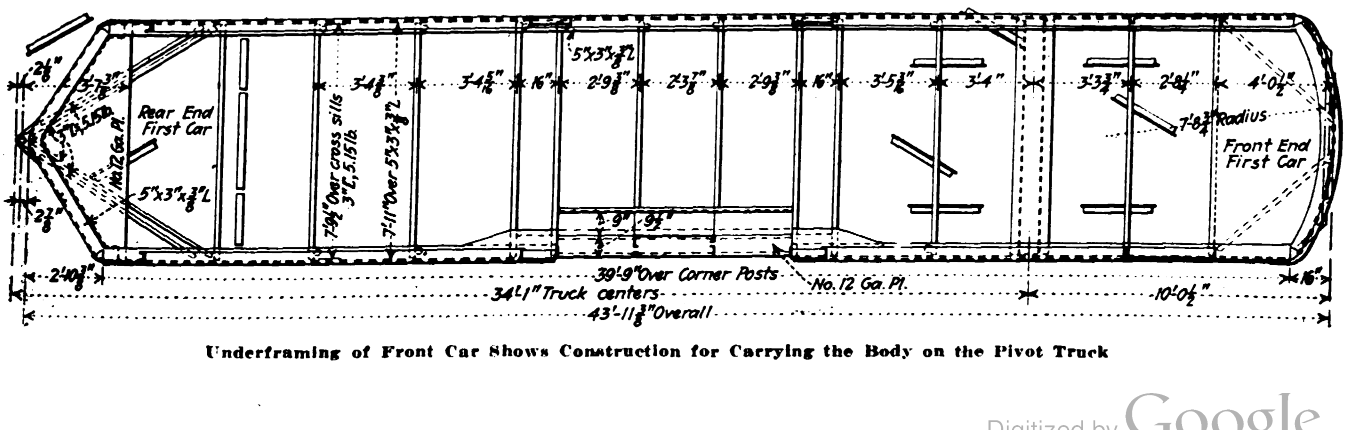

Clearance for breaks in grade
Wooden wiper against top of vestibule
Body floor
Longitudinal Section Through Vestibule
Wooden filler
Steel vestibule roof
1" Cork
⅛" Linoleum
¼" Pebble rubber mat
1¾" Flooring
A
A
Spring steel body side bearings
Retaining bolt through lugs in center bearing
Wooden wipers held against vestibule by tension springs across top and bottom
Channels at end of body slope away from vestibule at top to allow clearance for side sway
Vestibule floor plate
Spring steel body side bearing
Vestibule support
Circular vestibule side bearing
Truck bolster
Section A-A

The Vestibules Are Carried Directly on the Trucks and Form the Side Bearings for the Adjoining Bodies. Each Body Is Supported in a Separate Cup in the Truck Center Bearing

Clearance is allowed between the body end posts and the vestibule. As shown in the accompanying photographs and drawings, these posts are sloped away from the vestibule at the top to allow for rolling. In addition, clearance is allowed between the top of the vestibule and the body header. This is required to take care of vertical breaks in grade. As designed, the train will not only negotiate a 35-ft. radius curve, but also has clearance for a 10-deg. break in grade at the same time. The openings between the bodies and the vestibules are inclosed by wood wipers mounted in slides on the ends of the bodies and held against the vestibules by tension springs. This construction is clearly shown in accompanying photographs.

The vestibules are cylindrical in shape and are made of No. 14 gage sheet steel. They are of 54-in. diameter and are 6 ft. 6½ in. high inside, with a steel floor and top plate riveted to the cylindrical shell. The openings for the passageway are cut into the portion of the shell which extends into the car body. These openings are 22 in. wide and provide a clear passageway between the cars when the unit is operating on a track curve of 35-ft. radius.

Attention was also given to the problem of making the top of the vestibule weatherproof. The steel top is depressed 1 in. and is fitted with a wood disk 1 in. thick with an inverted bevel edge. The disk is made approximately 2 in. smaller in diameter than the steel top, so as to form a gutter between the rim of the depressed plate and the wood filler. This gutter collects any rain or moisture which may penetrate under the wiper board above the vestibule. Tubular grab handles extend full


2¼"
Rear End First Car
No. 12 Ga. Pl.
5"x3"x⅜"L
5"x3"x⅜"L
7'-9¾" Over cross sills 3"[, 5.15 lb.
7'-11" Over 5"x3½"x⅜"L
3'-4⅛"
3'-4⅝"
16"
2'-9⅞"
2'-3⅞"
2'-9⅞"
16"
3'-5½"
3'-4"
3'-3¾"
2'-8¼"
4'-0½"
7'-8¾" Radius
Front End First Car
2'-9"
9¾"
2⅞"
2'-10⅞"
39'-9" Over Corner Posts
No. 12 Ga. Pl.
34'-1" Truck centers
43'-11½" Overall
10'-0½"
16"

Underframing of Front Car Shows Construction for Carrying the Body on the Pivot Truck length on each side of the vestibule interior and these are connected to the gutter above so as to act as down spouts.

A layer of ¾-in. cork, covered with linoleum, is applied to the vestibule interior to deaden sound and give heat insulation. The same material is also used in the interior of the body, below the belt rail.

The side framing of the cars is of the straight plate girder type made of No. 14 gage sheet steel. The belt rail consists of a formed steel angle covered with a pressed channel which overlaps the outside of the girder sheet. Vertical stiffeners or fins are riveted to the side sheets at each window opening, but the ash side posts extend only from the belt rail to the letterboard. These short posts are held in aluminum socket castings by short heat-treated bolts.

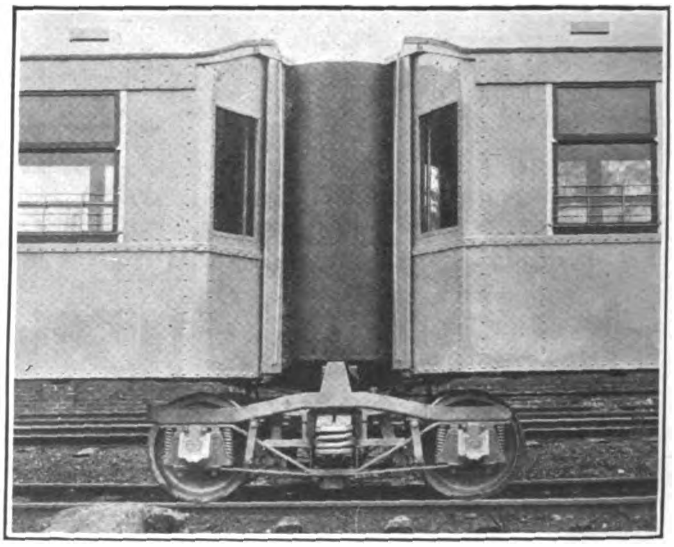
Cross sills made of 3-in., 5.15-lb. channel are spaced so as to support the car flooring. These are riveted to the underside of the side sill angles. The framing at the side door openings is reinforced by channels, plates and angles, to form the inside steps to the level car floor.

Cherry is used for the inside trim and is rubbed to a dull natural finish. The headlining is ¼-in. Agasote, curved to the contour of the roof. Railings and stanchions are made of 1-in. aluminum pipe.

In the two side front windows of the leading car the glass is framed in permanently. The glass in front of the motorman is ⅝-in. plate. This is used to give good vision and also to retard the formation of frost. The center front window is fitted with a specially designed sash which fastens tight against the outside of the posts, and is arranged so that it can slide sideways outside of, and in front of the left-hand window. A two-part folding dutch door is installed in the right-hand corner adjacent to the motorman's position. The upper half is glazed and the lower half paneled solid. Both the upper and lower halves of this door fold inwardly, thus making it convenient for the motorman either to make observations along the side of the train or to get out to throw switches, etc. Additional knee room for the motorman is obtained by running the air piping from the brake valve inside the dash structure.

K-35-JJ single-end control is used. The brake rigging is installed on the first and last car and is applied to the four trucks just as is done in an ordinary two-car installation. A brake cylinder, reservoirs and a GE-CP 127, 20-cu.ft. compressor are mounted under the front car, and a second brake cylinder and a pair of reservoirs are mounted under the rear car.

A standard Detroit five roll sign has been placed in the front hood. A similar sign is mounted on the side, over the door of the center car. This standard sign has proved particularly efficient in conveying sufficient information without the necessity of dash or auxiliary signs.



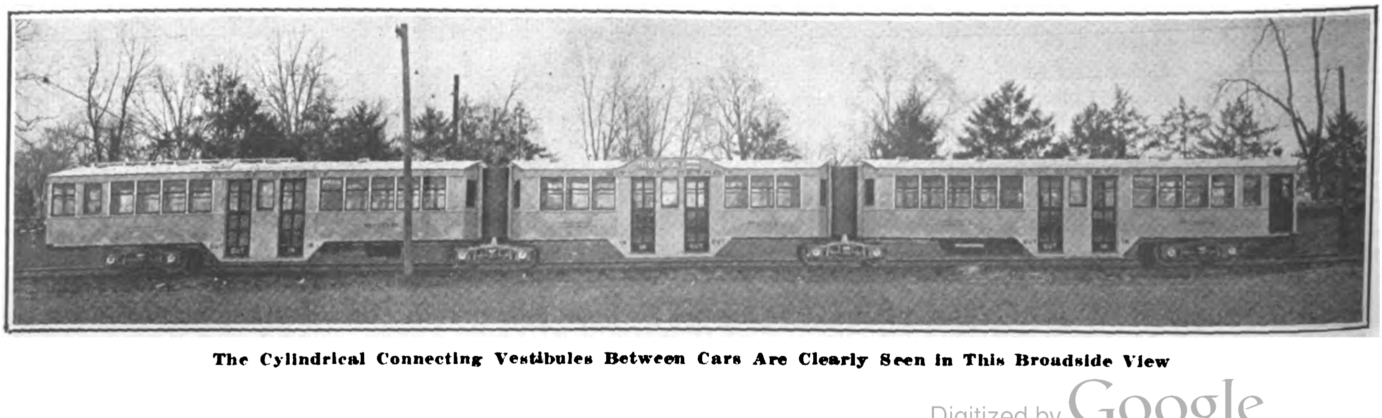
This View of One of the Connecting Vestibules Shows Its Mounting on the Truck, and Also the Center Bearing Castings for the Two Adjacent Bodies

The following material and equipment was used in the construction of the train:

Motors	G.E.-275
Air compressor	C.P.-127
Signals	Farraday
Control	K-35-JJ
Curtain fixtures	Curtain Supply Ring 88
Curtain material	Pantasote double face
Destination signs	Hunter Detroit Special
Fare boxes	Cleveland
Fenders	H. B. Lifeguards
Gears and pinions	G.E. long and short addendum
Hand brake	Cincinnati
Thermostats	Railway Utility
Heaters	Gold Car Heating & Lighting Co.'s nickel chromium wire
Headlights	Electric Service H. D. B
Paint	Pratt & Lambert enamel
Sand valve and traps	Ohio Brass
Seats	Cincinnati Car rattan covered
Safety treads	Kass
Trolley catcher	Ohio Brass
Trolley base	Ohio Brass
Ventilators	Nichols-Lintern
Headlining	Agasote

As articulated trains have been given serious consideration by a number of street railways for reducing the weight, first cost and operating costs of units on lines of very heavy traffic, the operation of this unit will be watched with considerable interest.

The Milwaukee Electric Railway & Light Company rebuilt some of its older type equipments into two-car articulated trains. These have been in operation for a number of years and have been very successful. The Brooklyn-Manhattan Transit Corporation has placed in operation a two-car articulated train made from some of its existing equipment. As both of these installations utilize existing rolling stock, it is thought that full advantage of articulation could not be obtained. The Great Northern Railroad of England has operated articulated units in steam service for a number of years with very successful results. The unit placed in operation by the Department of Street Railways, Detroit, however, is the first electrically propelled unit in which full advantage of articulation is utilized.



The Cylindrical Connecting Vestibules Between Cars Are Clearly Seen in This Broadside View

Traffic and Financing Topics of Midyear Meeting

St. Louis Gathering One of Largest Ever Held by American Electric Railway Association, Some 750 Attending the Dinner—Morning Session Devoted to Relief of Street Congestion, and Afternoon Session to Improved Financial Condition of Electric Railways—Many Committee Meetings Were Held

FROM all quarters of the country railway and supply men gathered at the Chase Hotel, St. Louis, on March 4 for one of the largest Midyear Meetings the American Electric Railway Association has held. The conference was primarily one of gathering information on two important subjects—street congestion and finance. The papers were very well received. Particularly timely were the papers and discussion on traffic, and great interest was shown in the subject. The papers at the afternoon session were devoted particularly to the reasons for and evidences of improving conditions in the industry. The banquet was attended by about 750, tickets having been sold for 769 places. Many of the delegates arrived on Sunday night and Monday morning, as Monday was occupied all day by numerous committee meetings. The convention was thus practically a two-day affair.

President Britton I. Budd, president Chicago Rapid Transit Company, presided.

ROLLA WELLS WELCOMES DELEGATES

In the absence of Governor Hyde the address of welcome was given by Rolla Wells, receiver of the United Railways of St. Louis and former Mayor of the city. He spoke of early experiences in transportation in the city. Formerly the railways sized up the public, he said, in order to obtain all from the public they could, but now the tables are turned and the public is sizing up the railway to get as much out of it as possible. The changing spirit of the times, he said, is reflected in the increasing tendency of the public to go into a copartnership with the electric railways and thus help them out in carrying their burdens.

President Britton I. Budd quoted figures to show the increasing importance of the electric railway industry, and the need for new capital that always exists if the industry is to progress. This year, he stated, there is needed from $200,000,000 to $250,000,000 additional capital. Part of this may be secured by what he characterized as public ownership of the best kind—the ownership of the company's junior securities. The appeal should be made to the users of the service that they must become partners in the business and supply their share of the capital so that they may continue to get the kind of service they desire. There are now nearly 2,000,000 stockholders in the electric light industry, indicating what can be accomplished along this line.

The White House
Washington
Feb. 28, 1924.

MY DEAR MR. SAWYER:

You are very thoughtful to remind me of this next meeting of the American Electric Railway Association which you are holding at St. Louis on March 4. My recollections of last year's gathering, when I had the privilege of addressing one of the sessions of the convention, are so pleasant that it gives me added satisfaction to ask you now to present my compliments and good wishes to the members of the forthcoming meeting. I have noted some gratifying evidences of expanding prosperity in your industry in the last season, and hope it may be further emphasized in the coming year.

Very truly yours,
CALVIN COOLIDGE.

Letter Addressed to W. H. Sawyer, Chairman Committee on Arrangements at the St. Louis Meeting

According to Mr. Budd, one of the companies of which he is president has recently put out 7 per cent "prior lien" stock to cover about one-half of the new capital requirements. Of a total of $1,500,000 of this stock about a million has been sold to users of the service.

Congestion was felt by Mr. Budd to be a serious problem, not alone of the street railways, but of the public as a whole. If congestion continues to increase, it may result in a need for grade separation to make it possible to pass traffic. Such changes as surely should not be the burden of the electric railway, inasmuch as they are an improvement for the entire community.

The motor bus is not regarded as a problem by Mr. Budd. Within a decade or a half decade he feels that every motor bus that is operating on schedules in this country will be operated by an electric railway. The manufacturers appreciate that the largest field for the bus is with the electric railway companies, and that they are the logical and the only agency for co-ordinating transportation.

Three situations confront the electric railway today. First is the problem of finance, which must be solved in the interests of those identified with the property, and which will also be in the best interest of the public. Next the fact must be appreciated that the motor bus is an adjunct that can be used for the advantage of the industry. Lastly, a program of modernization must be carried to completion. If these three things are followed through there will not be any serious problem.

Mr. Budd's speech is printed in full elsewhere in this paper.

STREET CONGESTION FEATURES MORNING SESSION

The theme of the morning session was street congestion. The general problem, with specific reference to St. Louis, was presented in a paper by Harland Bartholomew, city plan engineer of St. Louis. In this paper the need for decentralization of the business district was urged as the real solution of the congestion problem. This paper was followed by a discussion from the standpoint of Los Angeles, by G. B. Anderson, manager of transportation Los Angeles Railway; Cleveland, by J. J. Stanley, president Cleveland Railway (read in his absence by Paul E. Wilson); Chicago, by R. F. Kelker, Jr., Kelker, DeLeuw & Company, consulting engineers; Boston, by John H. Noyes, chairman street commission city of Boston. Abstracts of the first four of these papers are printed elsewhere in this paper.

The traffic problem in our modern cities was not slow of development, but was an acute attack following shortly after the advent of the motor vehicle, according to Mr. Noyes. Local conditions are in each case responsible for the traffic difficulties, so that it is difficult to generalize.

The street area in Boston is greater than that in many other large cities, but on account of the peculiar layout the streets are not so good for traffic movement. This, Mr. Noyes said, requires particular care in handling the local congestion problem. He is engaged in making a survey of the automobiles that are parked on the streets of Boston. From this he will determine which persons are using the streets for unnecessary parking and will request them to leave their cars at home and patronize the street railway. This will be possible, he believed, inasmuch as Boston is one of the few cities where there is close co-operation between the railway company and the city authorities.

Mr. Noyes agreed with President Budd that some person should be in authority to make the proper recommendations for traffic regulation and to enforce them.

FINANCIAL PROBLEMS DISCUSSED

The afternoon session was devoted to the subject "The Improving Financial Conditions of Electric Railways." This was presented in the form of a symposium, the subject being treated from the viewpoint of the investment banker by J. K. Newman, from the viewpoint of the economist by Richard T. Ely, and from the viewpoint of the holding company by B. C. Cobb. These papers are abstracted elsewhere in this issue.

The theme developed by Mr. Newman was that the public must be given more knowledge of the gains made by the industry in the recent past, and the outlook for still further improvement. He called attention to the fact that electric railway securities are now being considered as sound investments where the conditions warrant.

Speaking from the viewpoint of the holding company, Mr. Cobb pursued a similar line of thought, and he too was agreed that the industry has taken an upward trend in the security market.

Professor Ely laid particular stress on the point that there has not been sufficient attention paid to the question. Taxes have been increasing in all civilized countries for a hundred years and more. We are living under a law of increasing public expenditure, he said. This has resulted in a spread in the activities of government, so that now one dollar out of every seven earned goes to taxes of one form or another. For this reason he feels that we must all get a broader view of taxation. Education of the public was also urged by Mr. Ely. This is necessary to make effective any campaign of publicity designed to instruct the public in the necessity for a more tolerant attitude toward utility problems.

Following the presentation of these papers, on the motion of J. N. Shanahan, a vote of thanks of the association was given to the committee on meetings and subjects, to the committee on general arrangements for the meeting, and to the committee on local entertainment.

FEATURES OF THE DINNER

The Midyear dinner held on Tuesday evening at the Hotel Chase was marked with great enthusiasm. President Budd presided as toastmaster. During the course of the dinner he read a message from President Coolidge, which is printed elsewhere.

The address of welcome was given by Mayor Henry W. Kiel of the city of St. Louis. He said that if the companies give service they will come out of their difficulties all right. The public doesn't know what it wants, and for that reason the management can do a great deal in influencing public opinion the right way.

The speaker of the evening was Hon. Eliot Wadsworth, Assistant Secretary of the Treasury. He gave an excellent talk on the value of thrift and honesty in public business, which is printed elsewhere in this issue.

A defense of the Constitution and its provisions was made by Hon. B. F. Brough, Mayor of Toledo. He did not see any advantages in municipal operation of utilities, but felt that work of this character should be left to private enterprise.

SOME SIDELIGHTS ON THE CONVENTION

One feature of the St. Louis convention was the fact that every detail of the arrangements had been carefully worked out and all requirements of delegates anticipated. Under the direction of General Chairman W. H. Sawyer, president East St. Louis & Suburban Railway, the Birney Club of St. Louis and the Electrical Board of Trade were particularly responsible for these things. Transportation and guides were available all the time to show delegates anything they wanted to see. Quite a point was made of providing every possible personal service. A Fageol bus chassis with an American Car Company body and a Yellow Coach Manufacturing Company chassis with a St. Louis Car Company body were placed in the hands of the Birney Club for carrying delegates between station and hotel and for special trips.

A feature of interest to the visitors was a display of various types of street railway equipment. Alongside a bobtail car with a "hay motor" and one of the original drivers, who is still in the employ of the United Railways, was one of the latest cars of the same company and one of the new cars built for the Brooklyn City Railroad. Both of these cars were described in recent issues of this paper. These cars were placed on a side track adjacent to the Chase Hotel, and attracted much attention from the many delegates who visited them. The coaches which were in service transporting visitors were also a part of this exhibit.

Care was taken that the local people were informed through the newspapers that the meetings were open to the general public, and the subjects were announced with the comment that they would be treated from a viewpoint broader than the railway interest. At the banquet arrangements had been made to broadcast the speeches from station KSD, St. Louis *Post-Dispatch*. The careful planning was also reflected in the unusual seating list and menu, and the very attractive floral decorations. Three quartets, one of which was the Louisville Railway inspectors' quartet, helped to entertain.

*Electric Railways on Firm Basis**

By BRITTON I. BUDD

President American Electric Railway Association
President Chicago Rapid Transit Company

> **THE MAGNITUDE of the industry, the increasing ratio of annual rides per capita, the improvements being carried out, the greatly improved public relations inspire unbounded confidence in the future of the electric railways.**

THIS annual Midyear Conference of executives of the electric railways of the United States has met to consider two main problems which confront us. These are, first, the financial condition of electric railways and the necessity for new capital in the industry; and, second, the traffic problem in our large cities, which is steadily growing worse and causing great inconvenience to our citizens. I trust that our deliberations here may be helpful in the way of pointing to a solution of both problems.

We are on the threshold of an era that will demand a very large increase in our urban and interurban transportation facilities. To meet this growing demand, a steady flow of capital into our industry must be provided. We are here to discuss ways and means of stimulating this flow of needed capital. We cannot wait for others to solve these problems for us. It is up to this industry to lead the way to a solution. I shall not attempt to go into details of either of the subjects before us for discussion. These subjects have been assigned to experts, so that I shall confine myself to a brief outline of the importance of their solution.

More than 16,000,000,000 passengers were carried on the electric railways of the country in 1923. That is a considerable increase over the best previous year, and there is no doubt in my mind that each succeeding year will show a still greater increase. You electric railway executives are responsible for the safe and speedy transportation of this vast army of riders, an army outnumbering by more than 145 times the entire population of the United States.

For the services they performed the electric railways of the country last year were paid $1,100,000,000, a sum nearly equal to 2 per cent of the entire production of the United States. That gives some idea of the importance of our industry in the life of the nation.

The magnitude of the electric railway industry may be more readily appreciated when compared with other great public utilities. Our gross revenue last year was only slightly less than that of the entire electric light and power industry and vastly greater than the income of the gas, telephone or telegraph industries.

---

*Address before Midyear Meeting of the American Electric Railway Association, St. Louis, Mo., March 4, 1924.

The electric railways last year employed 302,000 persons, or 50 per cent more than were employed by the electric power and gas industries combined. The investment in the properties which we operate is approximately $6,000,000,000, a sum greater than the investment in gas, telephone and telegraph companies combined.

I have quoted these figures to show the magnitude and importance of our industry and to give some idea of the amount of capital that must flow into it in the future.

On a conservative estimate the traffic of the electric railways of the country will increase to the extent of 500,000,000 passengers a year. This will add to gross revenues more than $35,000,000 a year, and to produce that additional revenue will require new capital to the amount of $175,000,000 a year.

CUSTOMER AND EMPLOYEE OWNERSHIP

Where is this new capital to be procured? Most of it must come from the public using this kind of service through what is known as the customer-ownership plan. The electric light and power industry has now more than 2,000,000 stockholders, a very large percentage of whom have become stockholders in the last few years. If it can be done in other industries, it can be done in ours, and it is up to us to see that it is done.

About three months ago we started the sale of stock to customers and employees on one of the electric railways with which I am connected. At the present time 70 per cent of our employees are shareholders, or are acquiring stock on the monthly payment plan. The selling campaign is still under way, and the latest reports show that we have upward of 3,000 stockholders living in the communities served by our railroad. A majority of them are paying on the monthly installment plan. The average number of shares to a subscriber is between three and four. That shows how widely the stock is being distributed, and the wider the distribution the more friends the company makes and the better are its public relations. Our employees have sold all this stock, and while selling it to their friends and acquaintances, they have sold the company to themselves.

Compared with some industries ours is youthful in point of years. It has had its trials and tribulations. The supreme test came during the World War, and the fact that our industry survived through that trying period and emerged from it vigorous and healthy is the best evidence of its stability.

But as we grow older it is obvious that we must keep pace with the spirit of progress. Worn-out policies and methods of operation must be discarded. The equipment of the electric railway of twenty years ago is rapidly being discarded in favor of modern equipment. This is evidenced by the large number of new cars that were placed in service last year and the number ordered for this year.

For a number of years everything that ran on rubber tires was regarded as a bugbear by the electric railways. Experience has demonstrated that for mass transportation the gasoline-driven vehicle cannot supplant the electric car. We have very properly accepted the motor bus as one of the necessary adjuncts of our transportation business. We are rapidly becoming acquainted with its uses as one of the tools of urban and interurban transportation, and are co-ordinating it with our electrically propelled cars.

The general public is no longer looking to the individual, the often irresponsible operator, for bus service. It is looking for bus service to the well-established and responsible electric railway company.

The automobile is doing much to advance the comfort and convenience of the people. It is revolutionizing their habits, making it easy for them to move about, with the result that they are traveling more than ever before. The electric railways are profiting by this change of habit. The more the people move about, the more we carry on our electric railways. This is evidenced by the steadily increasing per capita rides in our metropolitan centers.

In another way the automobile has changed the habits of our people. It has taught them how they may travel in ease and comfort and with speed. Our aim must be to approximate that speed and comfort. We must provide more comfortable and attractive equipment than was considered necessary a few years ago. The electric railways that are providing these improvements are succeeding.

Increasing use of gasoline-driven vehicles has brought to our large cities serious traffic problems which our industry must help to solve. The great mass of the people ride on the electric railway and will continue to do so. They will not tolerate much longer the endless delays caused by the small minority riding in automobiles. Neither can the automobilists themselves afford to put up with the numerous delays they daily encounter. A solution of the problem must satisfy the users of both kinds of transportation service.

The answer in many places will doubtless be along the line of separation of grades, allowing the electric railways to give a rapid transit service. Such a solution will be economically possible only in the very large cities because of the enormous capital expenditures involved. I am told that General Butler, without a great deal of experience in the handling of traffic affairs, has, in a few weeks, brought about marked improvements in Philadelphia. These improvements have benefited the automobilist as well as the car riders and pedestrians. If General Butler can do that in Philadelphia, the trained and experienced executives of the electric railway industry, working in conjunction with city authorities, should be able to work out a solution in other congested centers.

The opportunities for the electric railway executive of tomorrow are infinitely greater than were the opportunities of the executive of yesterday. A few years ago it was enough that a successful operator should know how to handle men and motors. The successful executive of today must know a great deal more. He must have a thorough comprehension of public relations, of how to gain and hold the good will of the public. He must understand the modern value of advertising and proper publicity. He must know not only how to supply transportation service but how to merchandise it, for merchandising methods are as essential to the electric railway company as they are to the dry goods merchant.

Good public relations must be based on good service. The best selling methods will not succeed unless the goods are salable. The railway executive must give the best service that is possible, then tell the people what he is doing.

Much has been accomplished in this direction within the last two or three years. There is no doubt that the public is today much better informed on our business than it ever has been in the past. Through the educational work which our association and the individual companies have carried on, the public has come to understand the essentiality of our service. The public is today much more interested in the things we are doing to improve service than it is in the rate of fare. If we continue to make improvements and to tell our customers of the things we are doing for their greater comfort and convenience, they will be with us in anything we may undertake.

Our industry is one which requires the best management that can be obtained. Some industries, due to the peculiar characteristics of their business, may succeed with average managerial talent. The electric railway to succeed must have exceptionally qualified and capable management. The field offers bright prospects for the many young and capable men who are entering it as their life work.

As I travel around the country I see more and more electric railway companies putting new and attractive cars into service, cars equipped with every modern improvement for the safety and comfort of the public and for economy in operation. I see the remarkable growth in the freight handled by our interurban railroads. I see the demands of the public for improved service being met on many interurban lines with parlor and dining cars, and even sleeping cars on some lines. And I feel that an earnest effort is being made by our executives to perform the obligations which the nature of our business imposes upon them.

As I see the improvements we are making, the increase in the number of passengers we are carrying, the better understanding of our problems on the part of the public, and as I try to visualize the magnitude of the industry in which we are engaged and its future possibilities, I am inspired with unbounded confidence in the future of American electric railways.

Decentralization a Real Answer to Street Congestion*

By HARLAND BARTHOLOMEW
City Plan Engineer, St. Louis, Mo.

EFFORTS MUST BE MADE to obtain maximum use of street space, to reduce non-essential traffic in congested centers, and to increase street space where essential. Many plans proposed for relief may result only in increased vehicle traffic. Decentralization does not involve economic waste.

FROM a purely theoretical standpoint we could conceive of a city planned for an ultimate population, wherein a balance might be struck between the capacity of streets in the business district and that of approach thoroughfares. In this city effective separation of street car and automobile traffic might be accomplished, either by subways or by separate streets for each class of traffic, and wherein traffic space, including sidewalks, might be apportioned to building heights and character of property use. But this is purely speculation today, for we cannot limit the size of cities. It is more or less impossible also to readjust satisfactorily the streets of existing cities. Palliative devices such as subways and elevated roads are expensive and public opinion has not reached the point where it appreciates the relation between building heights and street congestion.

The average American city hesitates to strike directly at the basic causes of street congestion. City councils will refuse to enforce low building height limitations, because such structures are viewed as characteristics of provincialism and such regulations as an unwarranted interference with business opportunity. Apparently not until the economic waste of street congestion assumes appalling proportions will the community act in self-interest to solve this phase of the problem.

Street congestion is an economic problem and must be so approached. The losses due to traffic blockades and sluggish circulation touch every individual in the city. Living and business are both affected. Transportation costs rise. Movement from place to place becomes practically impossible. Property values which depend upon circulation become unstable. It is roughly estimated that the impedance to traffic in the central business district of Chicago due to parking alone causes an economic loss of $60,000,000 a year. This is a super-tax upon all citizens equal to one-third of the regular taxes levied by the city itself. It is obvious that such excessive and unnecessary charges, if long continued, will have serious results. Expenditures upon devices which offer only temporary relief merely postpone the day of reckoning.

All action and all expenditures should aim at a permanent solution of the traffic problem. The logical mode of attack should be by the following steps: (1) To secure the maximum use of existing street space; (2) to reduce the volume of non-essential traffic in congested centers and expedite the movement of that which remains; (3) to increase the amount of street space when economically justifiable.

Neither of the first two suggestions above need involve anything but minor outlays of public funds. Both would seem to be natural means of approach to the problem of street congestion. Certainly all possibilities of this sort should be exhausted before the city undertakes an ambitious program of street improvements.

USE OF STREET SPACE FREQUENTLY IMPROVIDENT

Street space was originally intended and designed as a means of access to and egress from private property. It was never intended for private use nor for the conduct of private business, including storage. Often where street space is not needed it may be leased for private purposes, usually for a fee. There is no more reason why street space should be given over to the parking of automobiles than there is for granting the wholesale grocer right to use part or all of the sidewalk and street space in front of his building for the storage of his commodities. Street space should be reserved for moving traffic wherever such space is so needed. The parking of automobiles is not a public responsibility and public funds should not be expended for this purpose. Automobile storage should be taken care of on private property, through private initiative, as other forms of business are conducted.

Some figures illustrative of the improvident use of street space may be of interest:

The streets of the business district of St. Louis with few exceptions are 60 ft. wide and have a normal capacity of four lines of vehicles. On these streets 2,500 cars may be parked. On an average day from 13 to 15 per cent of the number of standing vehicles are commercial. Pleasure cars alone occupy approximately 20 per cent of the street space. At a normal hour during the day moving street cars, providing transportation service for the general public, occupy but 1.5 per cent of the street space.

During the rush hour, when every available square foot of roadway ought to be devoted to movement, parked cars still absorb 20 per cent of the roadway. The vehicular flow, thus restricted and confined to narrower channels, slows down to such an extent that from 50 to 100 more street cars accumulate in the district than should be there according to schedule. Two thousand vacant standing automobiles cause the street cars, carrying 75,000 or more persons home from work, to lose from five to fifteen minutes of scheduled time. It is estimated conservatively that parking during rush hours reduces the efficiency of streets in the business district to 36 per cent. This is a matter which cannot much longer be disregarded. The conditions of the rush hour today will be normal conditions a few years hence.

Something over 52,000 vehicles entered the business district of St. Louis daily in an eleven-hour period in 1922. During the maximum hour by actual count 9,843 vehicles entered the business district, whereas there was only a total area available for parking 2,500 cars, or somewhat less than 25 per cent of the maximum hour arrivals. There is a parking limit of one hour in the St. Louis business districts. Even if this regulation were strictly enforced during the eleven-hour period but half the cars entering could be parked for the hour. As the volume of traffic increases, which is apparently a continuous process, and parking time is reduced, the proportion of parked vehicles to the total will become correspondingly less. Manifestly it is impossible to provide parking space in the streets of the business district of any moderate-sized city for the accommodation of all vehicles. Street space, therefore, should be put to the service of the greatest number. In Chicago it was found that passenger automobiles formed 51.3 per cent of the traffic volume entering the Loop on a normal weekday, but carried only 18.9 per cent of the passengers. Street cars formed only 2 per cent of the traffic and carried 74 per cent of the passengers.

As cities increase in size and traffic increases in even greater proportion merchants will find that an ever decreasing percentage of their customers are dependent upon the automobile for access to the shops and stores. And for even this decreasing number there will be less and less unlimited parking space in nearby street areas. The demands of circulation will have to be met and can only be met economically by withdrawing the general storage privileges previously granted. It should be obvious that this is a measure to which all cities eventually must turn.

---

*Abstract of a paper presented at the Midyear Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

ROADWAY WIDTHS SHOULD BE CHOSEN FOR THE TRAFFIC

The city, however, even with its streets practically free for moving vehicles, still has another means of lessening congestion and making streets safer. Roadways should be designed for the specific traffic service expected of them. Roadway widths have usually been and still are largely determined in an arbitrary manner by consigning a proportion of the total street width to roadway space. All roadways for modern traffic should have widths based upon the number of lines of traffic to be accommodated. Failure to adapt paving designs to the changed demands of vehicles has cost many millions of dollars in taxpayers' money and introduced unnecessary complications into the traffic problem. In one moderate-sized city of the Middle West the city engineer is still laying 30 and 40-ft. pavements in residence districts when 26 and 36-ft. would accommodate respectively three and four lines of vehicles just as well.

In the last five years the excess pavement charge against that city is estimated at no less than $125,000. Excess pavement, while not of serious importance as far as traffic in residential districts is concerned, becomes a great annoyance in congested centers. It invites disregard of parking rules and is a frequent cause of traffic accidents. It also reduces sidewalk space unnecessarily. A roadway which is really only wide enough for four lines of vehicles seems to be capable of carrying five or accommodating parked cars at all angles to the curb. The uncertainty which results from such conditions hinders the enforcement of proper traffic rules.

Careful study of roadway widths in congested centers will frequently show that a slight change here and there, either in parking rules or in the roadway itself, will make an appreciable difference in the flow of traffic. The pavements in the business district of Chattanooga, Tenn., were not designed for angular parking, but practically every street was so used. Vehicular movement was seriously impeded and traffic conditions were intolerable. Market Street, with a double-track car line and which should be a commodious six-line thoroughfare, was reduced to a two-line street, automobiles of all kinds and street cars using the line occupied by the rails. The introduction of parallel parking has cleared the street car right-of-way and opened up two new channels for other vehicles. Broad Street in the same city, a 126-ft. street, has a 96-ft. roadway and is theoretically capable of carrying ten lines of vehicles. Unsystematic parking on sides and center, however, has reduced this street to a two-line thoroughfare. Chestnut Street, with a four-line roadway, because of careless angular parking, at times becomes so badly blocked that automobiles must be moved upon the sidewalks to clear the street.

These are cases in which roadways properly designed for certain use become extremely inefficient through misuse. In the case of the Washington Avenue pavement in St. Louis, laid when the street was recently widened, it was found that a 50-ft. roadway with a double-track car line, while theoretically and actually capable of accommodating six lines of traffic, did so at such a loss of speed as to affect seriously the capacity of the street as a carrier. In order to reduce the hazard of passing between parked vehicles and street cars and thus to increase the traffic flow the curbs were set back 3 ft. on either side. The 56-ft. pavement now passes approximately twice the number of vehicles per hour.

Suggestions for Traffic Relief

It is impossible to provide sufficient street space for all automobiles.

The provision of parking space in city streets is not a public obligation.

The parked vehicle must give way to the moving vehicle.

Curbs should be so adjusted as to permit maximum use of roadway space based upon lines of traffic.

Every city should have a comprehensive city plan.

The volume of traffic should be reduced by excluding passenger automobiles from certain streets or from all streets in areas where congestion is most acute.

Building heights should be rigidly restricted.

Street widening, subway construction, arcading or elevated sidewalks do not in themselves constitute a solution of street congestion and should be undertaken only where economically justified.

IMPROPER TRANSIT ROUTING MAY CAUSE TROUBLE

The improper routing of transit lines is a common source of trouble in congested centers. Left-hand turns are frequently made directly across the flow of traffic on the busiest street. The delays thus caused react unfavorably upon all traffic on that street and upon cross streets. A slight change in routing which would not inconvenience the riding public would entirely eliminate many of these left-hand turns at strategic points and bring the remainder at corners not so important.

In Toledo the transit routing plan prepared for the city proposed the removal of car lines from alternate parallel streets in the business district so that each type of carrier might have its own thoroughfare. The movement of both the automobiles and street cars through the congested center would thus be greatly facilitated from the standpoint of improved transit service and relief of congestion. Such a separation of street car and automobile routes is highly desirable and should be undertaken at every opportunity. It is practically impossible to make effective use of street space so long as the flow of traffic is unsystematic.

One great contributing factor in street congestion is the unscientific street plan possessed by most cities. Unsystematic routing of traffic is frequently due to the lack of suitable streets. The automobile seeks direct routes and few of these are available in the average city. Even more difficult than the unscientific apportionment of roadway spaces in relation to lines of travel is the unscientific width and arrangement of streets that might be expected to afford a satisfactory scheme of circulation in any given community. A study of the traffic problem, even in small communities, usually discloses certain street openings, cutoffs or widenings, often inexpensive, whereby new routes of travel might be opened that would afford considerable relief throughout the whole city.

The development of a city plan is absolutely essential to any study of street congestion. While it is beyond the scope of the present paper to discuss the character and extent of a comprehensive city plan, suffice it to say that this embraces a street circulation scheme usually characterized as a major street plan, routing of transit lines, study of the railroad situation involving location of freight and passenger terminals and separation of grades at prominent street crossings, determination of size and location of recreation spaces and regulation of the use, height and size of all buildings, generally known as zoning.

It has been observed that as fast as new streets are opened they are generally used very nearly to capacity within the course of one year. This would seem to represent something more than the average increase of vehicular registration in the city and supports the theory that the more street space provided the more traffic is invited. This, of course, solves no problem and bears out the contention that it is impossible to provide sufficient street space for the movement of all vehicles, at least within a limited time, such as rush hours. The problem therefore resolves itself into one of whether there may be sufficient economic justification for any given expenditure. Within limitations that may probably be determined more or less accurately in any given case, remedial measures involving expense may be undertaken. In the St. Louis plan, for instance, most of the street widenings have been accompanied by increases in property values sufficient to pay for those widenings and benefit assessments have been levied approaching the total cost of improvements.

LIMITING THE VOLUME OF TRAFFIC

Statistics recently prepared show that of 152,339 vehicle movements in the business district of Baltimore only 21,036 were street car movements, while during the rush hour the 131,303 vehicles handled only 11 per cent of the total passengers carried, while the street cars handled 89 per cent. At the three most important street crossings in Montreal there were 75 per cent more vehicles than street cars, but these vehicles carried only 7 per cent of the passengers carried by the cars.* An examination of Table I indicates that the great bulk of vehicle movements in any business district consists of individual passenger automobiles that have little relation to the business of the district. The commercial vehicle traffic that undoubtedly does have relation to the transaction of business is less than 50 per cent of the total.

The passenger automobile causes most of our street congestion because of its great preponderance of numbers. It is therefore suggested that passenger automobile movement in congested districts be entirely restricted, or at least confined, to certain streets so that so much street space as may be necessary can be made available for the commercial vehicles that have most direct relation to business, and for street cars that carry by far the greater bulk of people.

INCREASING STREET SPACE A DIFFICULT TASK

Problems connected with the actual physical increase of street space should be solved through study of the city plan. Some relation should probably be worked out between the vehicular capacity of the business district and that of approaching thoroughfares. This is a difficult, but not impossible, matter of determination.

It is an obvious impossibility to widen streets in the existing business district. This is the condition that obtains in most cities of approximately 500,000 population or greater. In these larger cities measures for the relief of congestion have been suggested. Removal of street cars from the surface of the streets by building subways has been proposed, as well as the arcading of sidewalks, elevation of sidewalks and similar palliatives that do not of themselves constitute a solution of the problem of street congestion. They are mere makeshifts to relieve a temporary condition, and by their very nature will invite more traffic and consequently a pyramiding of problems, physical and financial.

Obviously the construction of subways, the arcading of sidewalks or the elevation of sidewalks cost considerably more money than the advocates of these proposals realize. Few cities, for instance, can afford subways in business districts or rapid transit lines outside the business districts. Table II has been prepared to show the approximate present costs of subways and the necessary riding which must take place in order to produce sufficient revenue to justify the expenditure. The figures are prepared on a basis of present prices and under conditions that obtain in St. Louis as regards fares and construction costs. From this table it has been estimated that St. Louis can scarcely afford rapid transit construction on the basis of present riding, and this is the condition that will generally be found to obtain in all but a very few largest cities.

To Reduce Street Congestion

The city plan should include a major street plan providing for ample traffic circulation between all parts of the community, with streets of sufficient number and width to constitute balancing of traffic movement and prevention of overconcentration at any one or more points.

Separation of commercial traffic from that of the pleasure automobile type is desirable and should be secured where possible.

No street should provide for more than eight lines of traffic. This does not imply that streets eventually intended to accommodate rapid transit lines should not be of sufficient width. Where possible this width should be 100 ft. for subways and not less than 200 ft. for elevated lines.

Safety isles should be provided at crossings for all six or more line roadways.

By-pass streets should be provided on all sides of the business district.

All approach streets to business districts hould be carried through the district.

The writer knows of no existing condemnation precedents by which anything approximating accurate estimates of costs for sidewalk arcading can be made. It is obviously an expensive process. The same is true of sidewalk elevation. With these, as with subway construction as means of relief from street congestion, one continuously reverts to the question previously implied in this paper as to why we should invite or undertake costs for those necessarily expensive projects when they do not constitute a real solution of the problem of street congestion. There is only one possible justification for any such measure, which in itself is not necessarily sufficient. This is that if in any particular instance where an extremely aggravated condition of congestion occurs, one of these several measures might properly be undertaken. This would not necessarily justify wholesale adoption of such measures for the relief of all street congestion. For example, it has been estimated that the value of time delays to individual vehicle movements justifies a capital expenditure of $6,000,000 for the double-decking of Michigan Avenue in Chicago, a notable improvement recently completed. The Michigan Avenue project cost approximately $15,000,000, of which $6,000,000 was attributable to double-decking, indicating that in this particular instance the large extra expenditure was justified. A peculiar condition obtains here, however, for Michigan Avenue is the most favored entry for automobile traffic to Chicago's Loop district from the north, the direction of the heaviest travel, and this traffic was formerly seriously impeded by cross-traffic between the business and wholesale district west of Michigan Avenue and the large freight house district east of this thoroughfare. Here was a special condition justifying the double-decking of the street that will probably not obtain at any other point in that great city.

Figures compiled by the same authority show that in the proposed South Water Street improvement, estimated to cost $22,000,000 and which involves double-decking similar to the Michigan Avenue improvement, $11,000,000, or approximately 50 per cent of the total cost, is directly chargeable to double-decking, whereas, on the basis of time delays to individual vehicle movements,

---

*From article by J. Rowland Bibbins, published in ELECTRIC RAILWAY JOURNAL, Nov. 10, 1923, page 813.

TABLE I—RELATION OF VEHICLES REGISTERED IN FOUR AMERICAN CITIES TO DAILY TRAFFIC

City	Population 1920	Total Autos Registered 1923	Number Vehicles Entering Business District Daily				Number of Passenger Autos Entering Business District per 1,000 Population	Per Cent of Vehicles Which Are Commercial
			Passenger Autos	Auto Trucks	Horse-Drawn	Total		
Chicago	2,701,705	260,393	42,130	17,180	14,500	73,810	15.6	43.0
St. Louis	772,897	92,714	33,253	10,780	2,805	46,838	43.0	29.0
Pittsburgh	588,193	......	32,416	20,554	7,545	60,515	55.0	46.3
Minneapolis	380,582	60,000	61,181	11,012	1,223	*77,727	162.0	20.0

*Error in addition in press copy received.—EDITORS.

TABLE II—COST PER MILE OF ROADWAY AND TRACK STRUCTURES NECESSARY FOR DIFFERENT KINDS OF URBAN TRANSPORTATION FACILITIES*

Kind of Transportation	Cost per Mile	Passengers per Mile to Pay Fixed Charges
Motor Bus	Cost per mile indeterminate because not furnished by the operating company, but by the municipality through direct and special taxes on other industries and individuals.	
Trackless trolley	$5,200	9,000
Single-track light traffic line	32,000	46,000
Double-track light traffic line	61,000	88,500
Single-track heavy traffic line	92,000	133,300
Double-track heavy traffic line	194,000	282,000
Two-track elevated, all-steel construction	540,000	486,000
Two-track elevated, steel and concrete	1,060,000	1,305,000
Double-track subway	4,800,000	5,570,000

* Estimates prepared for this article by W. E. Bennett.

the maximum justifiable capital expenditure was estimated at $3,000,000.* South Water Street is Chicago's principal produce center and naturally a busy and congested traffic center. If double-decking falls so far short of economic justification in a district of that kind, how much more unjustifiable it would be in other parts of Chicago's Loop and, for the same reason, unjustifiable in the business districts of other cities.

DECENTRALIZATION DOES NOT INVOLVE ECONOMIC WASTE

The suggestions here made that we could secure maximum use of present street space and then reduce the volume of traffic by excluding unnecessary vehicle movements and supplementing these by relatively small improvements, the immediate cost of which would be justified, can properly be criticised as not in themselves necessarily constituting a final solution of the problem of street congestion in any given city, and increased per capita ownership of automobiles will sooner or later result in business districts becoming fully as congested with exclusively commercial traffic as they are now congested by other vehicles. There can be no answer to this criticism so long as we permit cities to concentrate business in a relatively small area served by a limited number of narrow streets where buildings of greater and greater height are permitted.

It is believed that the suggestions above offered will constitute a solution of the street congestion problem for a considerable number of years and do not involve economic waste. Beyond that point there is but one conclusion that can be reached—either our congested, overcentralized cities will eventually become victims of economic strangulation, or business must be decentralized. This may come about in several ways. There may be an ever-increasing number of business centers developed in various parts of the city's area, constituting a city of metropolitan organization composed of small communities, each with its own center. Or the huge central business district must be flattened out by rigid height restriction and spread over an increasingly greater area. Each of these things is taking place in certain cities today in a more or less haphazard manner. The community developments and business centers in the great metropolitan districts of New York and Chicago are almost as well known as the huge business and theatrical centers; even in St. Louis there are five or six rapidly developing business centers in different parts of the city.

In some cities also height limits for buildings have been established under zoning ordinances, but there are often more compromises between what should be a reasonable height limit and the unlimited freedom for skyscrapers desired by avaricious land owners, ambitious architects or sentimental enthusiasts. Not the least of contributing causes to our present chaotic situation is the tax assessor who continuously increases assessments, thereby causing property owners to resort to measures inimical to the city's interest. We need more scientific tax assessment methods co-ordinated with more scientific city planning and vigorous curbing of the practices which directly or indirectly contribute to the present problems of cities.

The writer recently had the great pleasure of participating in a study being made under the auspices of the Committee of the Plan of New York and Environs. One of the many considerations involved was approaches to Manhattan Island, with special reference to the Hudson River crossing. One vehicle tunnel is now under construction, a bridge and three additional vehicle tunnels are under consideration, estimated to cost something in excess of $200,000,000. This condition strongly emphasizes the ideas conveyed in this paper. If this bridge and the three tunnels across the Hudson are constructed, who will pay the $200,000,000? After they have been constructed how many more will be necessary? Would they solve any problem? It is the writer's contention that if they were all built and opened tomorrow, each would be crowded a week later and traffic congestion on Manhattan Island would be twice as bad as today. If, on the other hand, sufficient time and study were given to the computation of the necessary amount of intercourse between Manhattan and the Jersey shore, a definite amount of vehicle space might be determined upon and probably found to be easily justified, and a reasonable method of financing arrived at without the blind piling up of debt that now appears inevitable for want of a well-defined policy.

The matter of traffic regulation, while important, has not here been considered. This is a regulatory matter rather than one of fundamental principle in the broad problem of street congestion. Certain phases of traffic regulation might be mentioned in connection with this discussion, however, but in order that this paper may not be unduly prolonged, these may be stated briefly in connection with certain other conclusions as follows:

It is impossible to provide sufficient street space for all automobiles.

The provision of parking space in city streets is not a public obligation.

The parked vehicle must give way to the moving vehicle.

Curbs should be so adjusted as to permit maximum use of roadway space based upon lines of traffic.

Every city should have a comprehensive city plan.

The volume of traffic should be reduced by excluding passenger automobiles from certain streets or from all streets in areas where congestion is most acute.

Building heights should be rigidly restricted.

Street widening, subway construction, arcading or elevated sidewalks do not in themselves constitute a solution of street congestion and should be undertaken only where economically justified.

The city plan should include a major street plan providing for ample traffic circulation between all parts of the community, with streets of sufficient number and width to constitute balancing of traffic movement and prevention of overconcentration at any one or more points.

Separation of commercial traffic from that of the pleasure automobile type is desirable and should be secured where possible.

No street should provide for more than eight lines of traffic. This does not imply that streets eventually intended to accommodate rapid transit lines should not tbe given sufficient width, and where possible there should be 100 ft. for subways and not less than 200 ft. for elevated lines.

Safety isles should be provided at crossings for all six or more line roadways.

By-pass streets should be provided on all sides of the business district.

All approach streets to business districts should be carried through the district.

Unsatisfactory handling of traffic problems today is due to the lack of a centralized authority having complete responsibility in the matter of street congestion. The whole problem has virtually been thrown upon the police department as the agency best suited to cope with the situation. It would seem that for the establishment and enforcement of permanent policies there should be created a separate department or commission or agency which should at least be charged with the duty of studying the problem and which should probably also be charged with full responsibility in handling traffic. Street congestion is not necessarily a police matter. The problem is sufficiently great to warrant separate consideration and a separate authority. Just as we have developed health departments with a uniform force to supervise health matters, a fire department to handle fire and a police department to keep public order, it would seem that there should be a traffic department to cope with congestion and with the many other problems arising out of the universal use of the automobile.

---

*Estimates furnished through the courtesy of Jacob L. Crane, Jr., municipal engineer, Chicago, and C. D. Hill, chief engineer Board of Local Improvements, Chicago.

*The Business of Government**

By ELIOT WADSWORTH
Assistant Secretary of the Treasury,
Washington, D. C.

BUSINESS MEN have direct interest in securing competent administrators of government business and should make that a part of their own affairs. Active support of Mellon plan of taxes urged. Street railway has shown enormous vitality. Relations with government better as understanding of business improves.

© Underwood & Underwood, New York
Eliot Wadsworth

THIS convention is typical of hundreds of others. You meet here to exchange ideas as to the most up-to-date methods and practices of your profession—the management of street railways. There are conventions for the same purpose of nearly every known profession, trade and business to which people travel thousands of miles each year for the purpose of keeping themselves and their business up to date.

There is one line of business in the country which holds conventions, but not this kind—the business of government. With a gross annual income from taxes of $7,750,000,000, federal, state and local government make our greatest business operation. This is $72 a year per person or $288 for a family of four, which is a substantial item in any family budget. The amount of taxes collected in 1922 was three times the collection in 1912. This business of government has grown at no mean rate. The one way available of meeting its increasing expenses is by making heavier demands upon the taxpayer.

HOW GOVERNMENT AFFECTS BUSINESS

It is safe to say that this money is all expended, and in addition one to two billion more borrowed each year to be expended on buildings, institutions, roads, schools and otherwise. The administration of these government units, from Washington to the smallest village, is in the long run the foundation upon which our entire business structure rests.

You have been talking all day of the problems of the street railway. I am going to talk of the government, using that term to include federal and local organizations. I want to point out how much government affects business and how the business of government could be benefited by the active attention of men who have business training and instincts.

As an official of the United States Treasury, I have seen something of the federal organization which expends over $3,500,000,000 a year. Taking a broad view, that much-talked-of government bureaucracy is a fairly effective machine and carries on with remarkable success and continuity. The employees, if at times underworked, are also in many cases underpaid. You who manage the street railways of the country come in contact with government officials from every conceivable angle. I have a feeling that you will concur, in a general way, with that statement when speaking of state, city and county governments.

You will get my meaning, perhaps, if you ask yourselves how often there is a breakdown in the water supply, the sewage disposal plant, a failure of the fire department to respond to a call, or a tardiness of the postman. You might add to that survey by thinking how often your tax bill has failed to arrive on time. At the same time you would not call these government operations strictly snappy and up to date. There are obvious reasons why this is the case which need not be enlarged upon.

EFFICIENCY DEPENDS ON THE MAN

The efficiency of every organization depends upon the type of men who run it. As a life occupation, government employment has not been able to compete for the highest ability with the super-call of money making. Public interest in government can improve this situation by making government jobs more attractive and honorable.

As civilization becomes more complicated, government in one form or another assumes greater control of the individual and takes over more functions of the community. Each year sees our daily lives more closely guided by law and regulation, more dependent upon the operation of community property by government officials. Governments regulate food supply, traffic, hours of labor, dictate health measures and operate everything from a baby clinic to a graveyard.

The street railway offers a good example of increasing government regulation. Look back on the happy-go-lucky horse car, the service almost without schedule, the capitalization only limited by the sky. It is not necessary to point out how this has changed. You know too well. All the ingenuity available in state commissions, legislatures, city councils, county commissioners, not to speak of citizens with ideas, has been expended in trying to make the street car a limousine for the passenger and fool-proof for the lame, the halt or the blind, on foot, on horseback or on flivver.

The street railway has shown enormous vitality—its managers great ingenuity. The one-man car, light car and motor bus feeder have helped to win in a life or death struggle for existence. The street railway still runs, carrying more people today than ever before in spite of public and private motor competition. It is a remarkable record.

But the regulation has come to stay and you are constantly considering problems of your business with government officials or commissions as intimately as though they were your partners. I am sure you will agree that just so far as these government representatives have an understanding of business, your relationship with them is more satisfactory, their regulation of you is more reasonable, and the results for the company and the public are better. That condition applies to every other industry touched by government regulation, and there are very few which are not.

When it comes to managing community operations, federal or local, the same type of ability is needed which makes a success in business.

DIFFERENCE IN APPOINTMENT OF MANAGER

After all, there is little difference, from the community point of view, between the management of a corporation providing electric light, gas or transportation, under strict regulation, and the management by community of sewers, waterworks, schools and highways. There is a marked difference in the kind of men that do the managing. On the board of directors of the public service corporation there are always prominent business men of the community who serve without pay, attend regular meetings and give their time freely when called on. Hundreds, perhaps thousands, of stockholders of the public utility watch the financial returns and take a continuous interest in the welfare of their company. Effective management means regular dividends.

The general managers of the government business are appointed on election day, for a term sometimes as long as six years, with little chance of being discharged for inefficiency. Boards of directors, in the form of city councils, state legislatures and Congress, are also elected. The furious efforts of candidates for office stir a momentary interest among business men in these important selections. The bigger a man's business the less time he usually has for political activity, and yet the greater stake he has in the efficiency of government management. It is rather the usual attitude of business men that they cannot participate in what is called politics, but which really is the management of community affairs. He hesitates to join the precinct, ward or state committee of his party, or to give some time to administrative work in the government. He pleads lack of time or that he is no good at that sort of work. Perhaps there is a little feeling that other business men will look askance at any one supposed to be "dabbling in politics," a phrase seldom used except in a slightly critical tone.

---

*Address presented at the Midyear Dinner of the American Electric Railway Association at St. Louis, March 4, 1924.

There should not be this difference. The government organization needs the methods and standards of successful business to yield dividends in the form of lower taxes and better service to the community.

Once in a while, some unusual occurrence focuses attention upon governments and their officials, a war, a financial panic, a police strike. People who have hardly thought of their government or its affairs for years suddenly realize their utter dependence upon the men whom they have in a most casual way elected to positions of authority.

Intense interest has been aroused in government affairs by the universal discussion of taxes and the Teapot Dome leases. The need of business men and methods in government was never more strongly brought out.

TAX MATTERS

The so-called "Mellon Plan" of tax reduction has focused public attention on a complete demonstration of the old saying that economy in government brings direct benefit to the taxpayer. This is not a new subject for orators, but it is seldom that the cause and effect are clearly associated in every mind. There may be a debate as to how taxes should be reduced. There is no question in any mind that the reason they can be reduced is because the federal government has cut expenses, shown a surplus each year and paid off part of the national debt. The figures should be repeated over and over again. They are the foundation of the Mellon tax plan.

THE NATION'S EXPENSES

FISCAL YEARS ENDING JUNE 30

		Surplus
1921	$5,500,000,000	$87,000,000
1922	3,800,000,000	314,000,000
1923	3,700,000,000	310,000,000
1924 (estimate)..	3,600,000,000	330,000,000
1925 (estimate)..	3,300,000,000	396,000,000

NATIONAL DEBT

Aug. 31, 1919..............	$26,596,000,000
Mar. 31, 1921..............	23,980,000,000
Jan. 31, 1924..............	21,842,000,000

A reduction of the nation's debt of $4,750,000,000.

This is all the result of good business management. In its operating departments the federal government has been given the greatest polishing and speeding up of its life. It has been done by business men. General Dawes and the crew he brought with him were all business men. They, together with the members of the Cabinet, have worked early and late to cut out useless activities and make more efficient those which are essential.

There is a dividend, in the form of lower taxes, coming to every citizen as a result of that work. Congress, as the board of directors of the nation, is now busy debating what form the dividend shall take. The people are anxiously pressing for action.

The so-called "Mellon Plan" for declaring that dividend was worked out by experts who have studied for months to determine the fairest and most constructive program for the good of every one. In advocating that plan, Mr. Mellon is not trying to dictate what should be done, but is seeking to show his reasons for considering that plan as the best. There has been no careful reasoning put forth in support of any of the other suggested plans which makes them appear better or more effective.

NEED FOR BUSINESS IN GOVERNMENT

When, in your business, you determine upon some new construction, some new service or financing, you ask experts to work out a plan, consider that plan from all angles, and then, if it looks sound and practical, carry it out. That is the business way—the best way. President Coolidge and Secretary Mellon, in insisting upon the Mellon plan, are only taking that same course. They consulted experts. They have considered the plan presented not only with those experts, but with thousands of citizens. They find an extraordinary feeling in its favor. They are fighting to have it enacted into law. If you want to help in that fight there is plenty to do.

The events connected with the leasing of the Teapot Dome have also centered attention on the government. I will not discuss them here except to say this: The President, Calvin Coolidge, has said that he would see justice done—the guilty punished according to the law, and the rights of the people protected. I, for one, am willing to trust his word and depend upon him to fulfill that statement to the utmost limit of his power.

But the facts disclosed cannot fail to emphasize the heavy responsibility resting upon executive officers. The enormous aggregate value of our national property is vividly demonstrated by the appraisal of this item, which is only one of many. The future of the country depends, in no small measure, upon the wise management of these great community estates.

GOVERNMENT IS THE BUSINESS OF THE VOTERS

If it is so, and I firmly believe it is, that public attention is riveted on the problems of government, and the acts of its officers, what effect will this have on the elections of next autumn? Will the voters realize that the national and local governments are their own business, spending the money which they provide, managing the property which they have inherited and will in turn hand on to the next generation?

I should like to feel that this extraordinary situation would call for an unusual vote next November and that the measure applied to the candidates for office, from the President down, would be their fitness to manage honestly and efficiently the business of the nation. Is it too much to believe that the voters can supply the same standard of judgment, in selecting a public official, either as an executive or a lawmaker, that they would in selecting a trustee for their own estate or a guardian for their children?

This is not a new suggestion. It is as old as the hills, but I want to point out as clearly as words can why it applies particularly to the present conditions in America.

If the business community, and that means the storekeeper, salesman, farmer, laborer, clerk and banker, feel as strongly as I think they do on this question of government management, what can they do about it? Clearly they cannot all run for office, but they can vote and in other ways have an influence in politics. The political party is built up on a series of committees, beginning in the precincts, wards, villages and counties. These local committees largely control the type of men who become candidates and go to state and national conventions.

These committees do the political work of the community, just as a small group manages the affairs of every lodge or social club. By taking an interest and doing a little work, they are in a position to decide what shall be done and who shall do it. A strong man, serving on such a committee, particularly when not seeking office for himself, can multiply his influence many times by becoming part of the power which runs and directs the so-called political machine, of which we hear so much.

INDUSTRY NEEDS EFFICIENT GOVERNMENT

The training and initiative which business experience alone can give must be made available to the management and building up of the organizations, which handle the all-important business of our governments. When it becomes as honorable to serve on these committees as it is to be a director of the chamber of commerce, the first national bank or the electric light company, business men will really make themselves influential in government affairs. In that way alone can government be put on a business basis and kept there.

We have object lessons enough in Europe of what a bad or weak government can do to its people. In the family of nations the United States stands out as a shining example of the benefits of sound management at a time when the older nations of Europe are tottering or have fallen from their foundations.

Public credit depends upon the ability and honesty of those who manage public affairs. Your industry—every industry—is dependent, in the long run, upon a stable and efficient government.

There are thousands of conventions like this held each year, all for the improvement of business methods, standards and profits. If the management of government is as important a factor in the business world as I believe it to be, then those conventions could well allow in their programs time for a discussion of government problems. Partisanship might be avoided, but if it could not, no harm would be done. The point is to focus attention on a business which is costing the people of the country $7,750,000,000 a year and improve its operation for the benefit of all.

*Traffic Relief in Los Angeles**

By GEORGE BAKER ANDERSON
Manager of Transportation, Los Angeles Railway

THE TRAFFIC PROBLEM in this city results from the lack of usable street room. Suggestions for relief include rigid restrictions on vehicles in the central district, separation of street car and vehicle traffic, abolition of synchronized traffic signals and barring through commercial vehicles from the business district. Height limitations for office and mercantile buildings are proposed.

LOS ANGELES has now more than 1,000,000 inhabitants, and the Los Angeles Automobile Club's estimate of the number of automobiles in the city on Feb. 19, 1924, is 327,000. On the same date in 1918 the number was estimated at 81,500, showing an increase of 300 per cent in six years. During this same period the number of street car passengers has increased more than 100 per cent.

The city suffers greatly in comparison with other large cities in lack of roadway. The proportion of the business districts devoted to roadway in various cities is as follows: Washington, 44 per cent; San Diego, 41 per cent; Cleveland, 39.5 per cent; Seattle, 37.5 per cent; St. Louis, 37 per cent; San Francisco, 34.5 per cent; Pittsburgh, 34.5 per cent; Portland, Ore., 34.5 per cent; Minneapolis, 30.5 per cent; Detroit, 29.5 per cent; Chicago, 29 per cent; Denver, 27.5 per cent; Salt Lake City, 25.5 per cent; Toledo, 24 per cent; Los Angeles, but 21.5 per cent.

The city blocks in the business district measure 660 ft. north and south. These streets, curb to curb, average but 54 ft. in width. Some of the cross streets are too narrow to permit the movement of automobiles except on the car tracks if cars are parked, and there is a great insufficiency of alleys.

On account of the great area of the city—approximately 300 square miles—the average length of haul, 4½ miles, is greater than that in most cities.

In congestion by automobiles is found the most serious cause of delay to all forms of traffic. A check of the central business district, covering approximately ninety blocks, showing the movement therein of all classes of vehicles from 6 a.m. to 6 p.m. on Dec. 19, 1923, an average day, shows 263,110 automobiles, 48,556 trucks—a total of 311,666 automobiles of all classes—and 12,025 street cars. From 5 p.m. to 6 p.m. there was a total of 34,449 automobiles and trucks and 1,436 street cars. The average street car load for this period was 77.7 passengers and the average automobile load 1.67 passengers, including drivers.

During the twelve-hour period each person traveling in an automobile occupied in linear feet 14.3 times as much space as each passenger carried by street car. At 1.67 passengers per auto, to carry one average rush hour street car load of 77.7 passengers would require forty-seven automobiles, which, in solid line of contact, would occupy 660 ft., while a street car occupies but 45 ft. on the average. Two and one-half moving automobiles of average length occupy space of the same length as that of a street car, but the street car averages in the rush hour twenty times as many passengers.

Automatic traffic signals are located throughout about 50 per cent of the most densely congested district. The system consists of semaphores, one on each corner of the intersection, synchronized, and operated electrically from a central station. Under this system, as on Michigan Avenue in Chicago, much time is lost to all classes of traffic daily through holding up the flow in one direction when there is no traffic ready to move on the cross street.

Parking of automobiles is prohibited in the congested district from 4 p.m. to 6:15 p.m. only. During the remainder of the business day forty-minute parking is permitted.

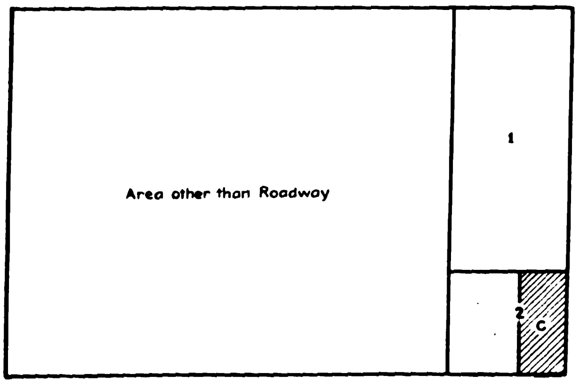


Fig. 1. The main rectangle illustrates the total area checked in the business district. 1, 2 and C represent the area of the total roadway, or 21½ per cent of the area district. 1 shows the roadway devoted exclusively to auto traffic, i.e., not street car tracks. This amounts to 76.1 per cent. 2 shows the roadway open to both autos and streeet cars, 23.9 per cent. C shows the proportion of roadway occupied by street cars in transit, allowing 4 ft. outside of the outer rails for clearance. Forty-one per cent of the roadway, or 9.8 per cent of the roadway area in the entire district, has car tracks.

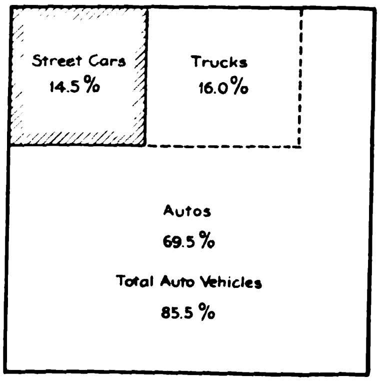


Fig. 2. This chart shows the apportionment of roadway in the entire district occupied by moving street cars, automobiles, trucks, from 6 a.m. to 6 p.m. on Dec. 19, 1923.

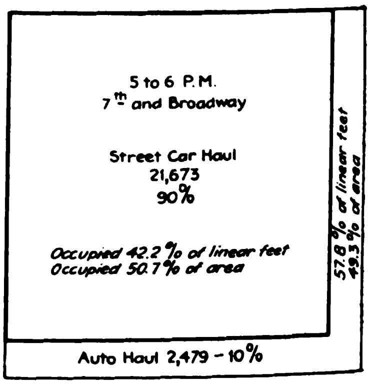


Fig. 3. Comparison of passengers carried, linear feet occupied and area occupied on one of the downtown lines by street cars and automobiles during the rush hour from 5 to 6 p.m. on an average business day.

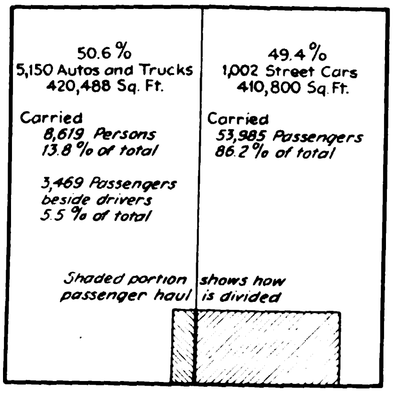


Fig. 4. Comparison of roadway space occupied and passengers carried by street cars and autos on the Seventh Street and Broadway Line from 3 p.m. to 6 p.m. on Nov. 13, 1923.

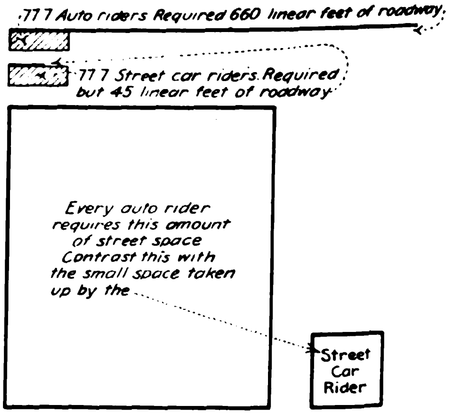


Fig. 5. This chart is based on traffic north and south on Broadway passing Seventh Street between 5 and 6 p.m. Nov. 13, 1923, when 209 street cars carried 16,219 passengers and 735 automobiles carried 1,202 persons.

To carry 77.7 passengers by street car required 45 linear feet of roadway. The same number of passengers (including drivers) was carried by autos requiring 660 linear feet.

These Charts Have Been Used by the Los Angeles Railway to Illustrate the Relative Merits of Street Cars and Automobiles for Mass Transportation

---

*Abstract of paper presented at Midyear Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

In Los Angeles our big problem, so far as mass transportation is concerned, involving both street car and automobile traffic, lies in the lack of usable street room. The suggestions for relief that follow are based upon the conviction that in most cities transportation will continue to be conducted for a long time to come upon the surface, on account of the time required for the planning of a definite project acceptable to all interests and the tremendous capital investment required for the construction of adequate subway or elevated systems, or, as probably will be found advisable in Los Angeles, a combination of both.

PROPOSED REMEDIAL MEASURES

First—Separate the two classes of traffic in business districts. Either (a) set aside certain streets for the exclusive use of automobiles and other streets for the special or adequately protected movement of surface cars; or (b) set aside a portion of all streets on which there are car tracks for the exclusive use of each class of traffic so that there will be no unnecessary interference between the two. This would be a chief measure of relief for the heavily traveled business district.

Second—Separate traffic outside of the business area as far as practicable by providing numerous boulevards for automobiles exclusively. On streets equipped with tracks for main car lines confine automobiles to the area outside the tracks, and as far as practicable restrict the use of this space to automobiles whose destination is on such street and those needing to cross it. Allow right angle crossings and right turns only so far as practicable.

Third—Separate automobile traffic into two classes, slow moving and rapidly moving vehicles, and keep the slow moving vehicles as close to the curb as practicable. Prohibit the use of streets in the central business district by trucks, delivery wagons and horse-drawn vehicles during the hours of the heaviest mass transportation. Prohibit parades of all kinds at all hours within the confines of any business district. Establish a maximum speed for slow moving vehicles and a minimum speed for fast moving vehicles traveling on boulevards set aside for the use of such vehicles.

Fourth—Protect main trunk line boulevards and main avenues occupied by car lines by the boulevard stop system. Ohio designates all streets and roads used by electric railways as main thoroughfares, gives vehicles and street cars using these thoroughfares the right-of-way over those entering intersections. An editorial in the ELECTRIC RAILWAY JOURNAL of Oct. 6, 1923, on this matter is very much to the point.

Fifth—Establish raised loading platforms in all sections where traffic is most heavy. They should not be closer together than 660 ft. on the average and should be established without specific relation to street intersections where necessary to secure fairly even spacing, making permanent the skip stop. The erection of these platforms would permit automobiles to keep moving when street cars stop. Prohibit automobiles from driving to the left of the safety platforms in congested districts, thereby permitting cars to berth and unload passengers at these points without interference from automobile traffic.

Sixth—Abolish parking of automobiles in the congested district from 7 a.m. to 7 p.m. every day, with the possible exception of Sundays and legal holidays. Elimination of parking is the cheapest way to provide additional roadway space. In outlying districts prohibit parking for at least 30 ft. back of street car loading zones. In the business district prohibit the stopping of automobiles to take on and discharge passengers at least 20 ft. back of loading zones. This would prohibit United States mail wagons from collecting mail at corners and would automatically result in the changing of the location of mail boxes to other points.

Seventh—Abolish all synchronized automatic crossing signal systems. Where it is found advisable to control the flow of vehicular, street car and pedestrian traffic at an intersection with the aid of mechanical devices such as semaphores, place the control in the hands of a traffic officer, who will operate the mechanism controlling one or more blocks as the needs of various avenues of traffic demand. The flow of pedestrian traffic at all points where mechanical signaling devices are installed, or where a traffic officer is stationed, should move in the same direction and at the same time as other classes of traffic.

Eighth—Prohibit left turns at all points in the heavily congested district, including turns out of alleys, garages, oil stations, parking places, etc.

Ninth—Limit the width of commercial vehicles of all classes.

Tenth—Route outside of the congested district all commercial trucks having no collections or deliveries to make in that district.

Eleventh—Route police and fire machines where possible by flasher signals.

Twelfth—Limit the height of office and mercantile buildings, thus avoiding a measure at least of the danger of overcrowding any section. Had no limit been placed upon the height of buildings erected in Los Angeles, long before this we would have been faced with the necessity of forcing a very generous staggering of business closing hours.

Thirteenth—Secure statutory enactment providing for the examination of applicants for drivers' licenses, requiring all applicants to show that they are over eighteen years of age, understand the important features of the traffic laws, have reasonably correct sight, are of sound hearing, of sound mind and are in generally proper physical condition to operate a car with safety.

Accompanying this paper will be found a set of charts based on the traffic survey made in Los Angeles Dec. 19 and 20, 1923.

◆

*Suggestions for Relief of Street Congestion**

By R. F. KELKER, Jr.
Consulting Engineer, Chicago

Chief causes of congestion in all cities outlined—Prime factor in present congestion is traffic to and from high buildings—Building heights should be limited as measure preceding rapid transit, and parking should be prohibited — Elevated or depressed sidewalks, one-way streets, traffic signals, etc., do not provide major relief.

UNTIL recent years street congestion has not assumed sufficient importance to warrant a thorough investigation, consequently many superficial plans of relief have been suggested and put into effect. Those who have had the opportunity to study the situation more closely have come to realize that an effort must be made to strike at the fundamental causes of street congestion. It therefore seems appropriate to set out briefly the chief causes that underlie the conditions which are found in all our cities from coast to coast.

1. Centralization of commercial, civic and social activities which result in (a) construction of excessively high buildings within comparatively small areas, and (b) the overpopulation of these areas through business hours.
2. The astonishing increase in motor vehicles in recent years, which has been without parallel in any other form of unit using the streets.
3. Inadequate width of roadways, rendered so by the volume of motor vehicle traffic, which could not have been foreseen at the time of dedication.
4. Deficiency of through streets and alleys because of vacations of public property at a time when value was low, and lack of co-ordination of subdividers at time dedications were made.
5. Interference with circulation by railroad terminals and yards, by rivers and other unfavorable topography.
6. The attempt to move all classes of traffic—freight, passengers and pedestrian—upon a single traffic plane.
7. Unrestricted parking of vehicles, which results in devoting a considerable portion of street space for the purpose of storage of privately owned vehicles.
8. Failure to adjust street car routing to meet present traffic conditions in so far as service conditions may permit.
9. Infractions of traffic regulations.

The principal effect of traffic congestion is economic loss and, as has been pointed out by Mr. Bartholomew, this loss in a congested area of Chicago is roughly estimateed at $60,000,000 per annum. Add to this loss similar losses in other large cities and we have a tremendous loss for the nation. Beyond this loss, however important it may be, we must also measure the inconvenience, and at times hardships, to which the public is subjected by traffic congestion and its effect upon health, as well as the thousands of hazards that it creates. The story is the same in all cities and there are few civic matters which are more in need of thorough investigation.

---

*Abstract of paper presented at the Mid-year Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

In Chicago we have in the Loop district about 300 sq.ft. of private occupational area for each 100 ft. of roadway space, exclusive of sidewalks. Consequently this 100 ft. of roadway space would in all probability adequately serve 1,500 sq.ft. of building area, as measured by the number of floors.

Many approximations of the relation of traffic demand and population have been made, and it is generally conceded that the increase in traffic demand varies between the first and second power of the increase in population. These powers at least seem reasonable limits.

Assuming as a normal condition 100 sq.ft. of roadway space, five-story buildings and 1,500 sq.ft. of occupational area, then we may estimate the equivalent traffic values for floor space for buildings of greater height, by using the powers representing traffic demand. The following table shows the traffic demand on this 100 sq.ft. of roadway for buildings of various height:

Number of Floors	Equivalent Traffic Demand 1st Power	 1½ Power	 2nd Power
5	1,500 sq.ft.	1,500 sq.ft.	1,500 sq.ft.
10	3,000 sq.ft.	4,250 equivalent	6,000 equivalent
15	4,500 sq.ft.	7,800 equivalent	13.500 equivalent
20	6,000 sq.ft.	12,000 equivalent	24,000 equivalent

The average height of buildings in the Loop district in Chicago has been estimated at ten floors, which I believe is rather in excess of the fact, but we know that the traffic congestion resulting from buildings of this average height has produced extremely unsatisfactory conditions. By referring to the table we see that the traffic demand of ten-story buildings on the basis of the first power has been doubled and on the basis of the second power has been quadrupled. Therefore there should be no reason for surprise if congestion exists. For twenty-story buildings, which are permissible in the central district in Chicago, the volume of traffic would lie between four and sixteen times the normal loading, or, expressed in square feet, between 6,000 and 24,000. These figures show that the percentage of roadway area, considered from the point of view of traffic demand, is so small as almost to vanish. Consequently, it is certain that the prime factor in present street congestion is the traffic that flows to and from our high buildings, and the cost that the general public bears through loss of time and inconvenience is enormous.

The solution applied in New York by building rapid transit lines to reduce street congestion brought about by the erection of high buildings, aside from other very definite benefits, has not been of marked success, and the overburden of the enormous cost of rapid transit construction is appalling, particularly in view of the fact that the congestion still persits. I do not take the position that rapid transit construction is not worth while; it is vital to the well being of any large city. But I believe that in order to prevent unusual and disastrous congestion the limitation of the height of buildings must be made effective before rapid transit on a large scale is undertaken.

Therefore, I believe that the first step to prevent the increase in congestion, which is inevitable by reason of the growth of vehicular traffic and of improved transportation facilities, is strictly to limit the height of buildings and to make this limitation as low as is consistent with the height of existing structures and street spaces available for traffic purposes.

PROHIBITION OF PARKING

In regard to the present moment, the most convenient way to bring about relief is to prohibit parking where it interferes with the proper movement of commercial and passenger carrying vehicles. The annoyance to which street car riders are subjected in all cities is great, and I have never been able to understand why the street car patrons do not support prohibitive parking measures. It seems unreasonable that a comparatively few people can utilize the most valuable street space in our cities, practically at will, for their own pleasure and convenience and to the serious inconvenience of thousands of their fellow citizens.

Many cities have adopted restrictions more or less drastic in their nature which have had certain beneficial results. The difficulty of enforcement is one of the chief troubles with parking prohibitions, and it has been found that limiting the time of parking to a half hour or to an hour does not do away with the nuisance. The construction of public garages by the city has been suggested many times, and I see no reason why cities should not build enormous garages for storage at the taxpayers' expense and make no charge at all for the service, as this would be entirely consistent with maintaining unlimited parking space in the most valuable streets in the city.

The statement has frequently been made that the prohibition of parking is unjust because it is a type of class legislation. This, I believe, would be a statement of fact if in the central areas of our cities all of the cars in the district could be parked and everybody would have a fair chance. In the Loop district in Chicago there is, roughly, space at the curb to accommodate about 3,300 cars, and there are more than 250,000 cars in Chicago and the immediate suburbs. For the reasons above stated I believe the prohibition of parking in the central business districts during all of the business hour of the day is the most effective means of obtaining immediate relief, and without cost.

If any city adopts this principle for its central district it then should be applied in any other part of the city where the passenger carrying vehicles are delayed by parked cars. There are thousands of feet of curb space everywhere adjacent to main arteries, car line streets and business areas which are open to the automobile public for the purpose of parking. For a person to walk a few hundred feet is not a hardship, but when his activities delay the movements of hundreds or thousands of people he then should be compelled to make this contribution to public welfare.

The work that has been done by planning commissions and planning engineers throughout the country has been very commendable and the opening up of new major arteries, widening of streets, removing various classes of restrictions, together with planning for future traffic movements, has been and will be of great benefit in many cities. All of this work, however, will be rendered partly valueless unless the building limitation situation is taken care of and prohibitive parking legislation adopted and enforced. There are enough vehicles now in any city to completely fill the streets in the business district from curb to curb and there is also enough land to be improved to accommodate high buildings that will destroy the benefits of city planning.

We are all familiar more or less with the various expedients that have been suggested for congestion relief, such as sub-surface sidewalks, elevated sidewalks, bridges, subways, etc., all of which are supposed to remove the pedestrian from his present hazardous location. Their utility depends wholly upon the establishment of a transportation plane with reference to a traffic plane. If elevated sidewalks are adopted for pedestrians then other forms of public passenger carrying vehicles should move on the same plane, if any real benefits are to be derived. Similarly, if sub-surface sidewalks are to be utilized they will be effective only when they are made an integral part of an underground transportation system. Further, the methods of financing such improvements should be very carefully considered prior to their adoption.

Regulations which provide for one-way streets, prohibition of left-hand turns, etc., installation of traffic signals and the like, may prove desirable in controlling traffic movements where unusual conditions exist, or at special locations where control is necessary. Such attempts for relief do not strike at the root of the matter and cannot be considered properly as major measures for relief.

In order to correct congestion which arises from unbalanced traffic conditions the provision of one-way streets is desirable. At certain intersections the prohibition of left-hand and sometimes right-hand turns will prove worth while, provided, however, that there is adjacent street space eventually to handle the increased mileage. Traffic signals afford the maximum benefit to the pedestrian, and there are locations where, in the interest of his comfort and in the interest of safety, they should be installed. It must be borne in mind that the control of traffic by automatic signals will reduce speed, and consequently their operation causes the motorist to contribute to the general welfare of pedestrians on the streets.

To sum up, permit me to suggest that support be enlisted everywhere to secure a reasonable limitation of building heights and to the prohibition of parking where the interests of thousands are sacrificed by the convenience, real or imaginary, of the comparatively few.

As further aids for unusual conditions, the adoption of appropriate regulations is recommended, and above all, support should be given to the enforcement of all sound traffic regulations which are adopted in the interests of safety and general welfare.

*Improving Traffic Conditions in Cleveland**

By JOHN J. STANLEY
President Cleveland Railway

REGULATORY MEASURES to relieve the existing conditions of street congestion should be enacted, but the underlying causes should be removed by suitable laws and restrictions. Synchronization of traffic, prohibition of parking, one-way and restricted streets are among remedies proposed for immediate adoption. The writer holds that traffic will have to be limited in future as population grows.

THE lamentable facts concerning the whole matter of traffic congestion are that it has taken so long to awaken business men to its ill effects, and that the situation has been permitted to reach a critical condition before any active interest has been shown by communities as a whole. The problem divides into two distinct parts: (1) The adoption of laws, restrictions, etc., which will remove, as completely as possible, any causes increasing and intensifying the situation; (2) the adoption of measures both regulatory and constructive which will relieve if not solve the problem as it is today.

The handling of this matter by one centralized authority, as recommended by Mr. Bartholomew, is to be commended. Such authority may be in the form of a commission or may be an individual, but it should be solely responsible for the handling of all traffic problems as related to the congestion of streets and to the transportation of passengers from one section of the city to another.

I wish to express my approval of Mr. Bartholomew's views on decentralization. This only will succeed in reducing the rate of increase of congestion. While automobiles and high buildings are the main causes of traffic difficulties, there are other contributing causes which are by no means negligible. Greater spread of a business district of any city requires many people to travel greater distances between their homes and offices and between offices in the course of a day's business.

The second division, to which the great majority of traffic students have been giving their attention, is the relief of existing congestion. Before taking up any detailed points concerning this I wish to set forth one warning, namely, that this is not a mathematical problem which once solved is always solved. Constantly changing conditions, many of them beyond the control of the city planners, alter the situation and its intensity. These changes cannot be accurately forecast, therefore plans which may be made for the relief of congestion should be so formulated and carefully laid out as to co-ordinate with probable future requirements. This will be possible only through an authority which has the power and ability to handle the problem as a whole.

BOTH LEGISLATION AND ENGINEERING PROGRESS CAN REDUCE CONGESTION

In taking up some of the methods which have been advocated for the relief of existing traffic congestion, I wish to divide them into two general classification: (1) Those which are confined to ordinances, regulation and enforcement and do not require any physical changes or engineering construction; (2) those based largely on engineering projects.

Under the first heading will come all laws relating to parking, synchronization of traffic, the prohibition of either truck or pleasure vehicles on all or certain of the streets of congested districts, enforcement of majority as well as seniority rights for street cars, the adoption of arterial highways and boulevard stops, the staggering of store, office and factory hours, the rigid prohibition of careless driving, rigid enforcement of all laws and the education of the traveling public. All of these are forms of relief of existing traffic conditions. They have been the subject of considerable thought by city authorities, street railway men and others.

There are some points which Mr. Bartholomew has mentioned which require comment. First, with regard to parking. From the standpoint of street railway men parking is one of the most serious handicaps to good service. The advantages of strict enforcement of no-parking ordinances has been clearly illustrated in Cleveland during the present year. With the inauguration of the new city administration under the manager plan, the authorities started an immediate campaign for improvement of traffic conditions, and called a conference of citizens including representatives of all organizations interested in the traffic situation. As a result of this conference and at the instigation of the Cleveland Railway orders were given to the traffic department of the police force to enforce rigidly all existing traffic ordinances.

One of these ordinances concerned parking on Euclid Avenue, the busiest street in the city. The ordinance permitted one-hour parking during the base hours of the day, but prohibited parking on the inbound or north side of the street from 8 to 9.30 a.m. and on the south or outbound side of the street from 4.30 to 6.30 p.m. in the congested district. The effect of the enforcement of this ordinance on the operation of the Euclid Avenue cars was immediate and gratifying. Cars which had been reaching the end of the line in the evening rush hour fifteen or more minutes late lost comparatively little time. The same result was apparent in the morning but to a lesser degree, because the morning rush is not so marked as that in the evening. The Cleveland Railway has for a long time advocated no parking on the downtown streets on which car lines are operated, but up to the present the city administration has not been impressed with the necessity for this move.

PARKING SHOULD BE PROHIBITED

The reduction of the time limit for parking has been the subject of much discussion. Many cities are reducing the time limit to less than an hour and in one case ten minutes has been suggested. I realize that there are several points of view on this subject and am, personally, firmly convinced that parking should be prohibited at all times in the terminal districts of the larger cities. A careful analysis of automobile collisions on some of the busy thoroughfares of Cleveland indicates that 80 per cent are directly or indirectly caused by the automobile being permitted to park. If parking is permitted at all, from the standpoint of street railway operation I believe that all-day parking is preferable to short time-limit parking. The latter means many entries and exits from any one parking space. At each entry or exit other machines operating in the street are delayed or forced onto the car tracks, with resulting delay and danger of accident.

Mr. Bartholomew has suggested the rerouting of street cars so as to eliminate left-hand turns. Where no traffic officer is stationed right-hand turns are less conducive of congestion than left-hand turns, but careful analysis shows that the difference is not great, if we consider street cars only. On the other hand, the routing of loop lines so that the majority of turns are right-hand requires one left-hand turn and a crossing of the lines themselves.

*Abstract of discussion presented at the Midyear Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

The separation of street car and automobile streets would greatly facilitate traffic and from the standpoint of the street railway operator is a decided benefit. In fact, if it can be carried to the extreme and all automobiles kept off of the streets designated for street car use, it is equivalent to the grant of a virtual private right-of-way to the transit company.

Much more probable of adoption is the one-way street system, concerning the advantages of which there is considerable difference of opinion among traffic students. Most of our large cities have adopted one-way streets to a greater or lesser extent. Philadelphia and Pittsburgh are notable examples of cities in which some of the principal retail business streets are designated as one-way streets.

It seems certain that the volume of traffic in the business districts of our great cities must be limited by some means in the near future. This limitation is to some extent automatic. In small cities of less than 100,000 population a large proportion of automobile owners drive to work. As the population increases this proportion decreases, due to the limitation of space available for all-day parking, and to the exasperation and danger from accident connected with driving in the congested district. These tendencies are favorable, but further limitation must be provided.

PROHIBITION OF CERTAIN VEHICULAR TRAFFIC MAY BE NECESSARY

Of the four forms of traffic using the street space between curbs, viz., street cars, passenger automobiles, trucks and motor delivery wagons, and horse-drawn vehicles, it has been suggested that two may be prohibited, at least during congested hours. Mr. Bartholomew has suggested the prohibition of the use of streets in the congested district to passenger automobiles, and Barron Collier has suggested that trucks, delivery and horse-drawn vehicles be excluded during day hours.

The rights of building owners must not be overlooked when considering no-parking or no-stopping ordinances, one-way streets and prohibition of the use of streets to any type of traffic. It is doubtful if a law prohibiting the stopping of automobiles in front of any property would stand the test of a court action if the building owners should attempt to enforce their rights. This, then, resolves itself into a question of to what extent property owners consider that the prohibition of parking and stopping benefits or harms their business when the results, as a whole, are taken into account.

From the standpoint of the street railway operator, subway or elevated construction is far more desirable and effective than street widening because it provides a private right-of-way totally free from the interference of any other form of traffic. The construction of subways and elevateds, the arcading of buildings and the widening of streets are very expensive and should not be attempted unless economically justified. The question of the dollars-and-cents justification of subway and elevated lines is very difficult to determine. Experience has shown that within a very short time after a new street or rapid transit line has been opened it is used to capacity. Does not this in itself prove that it was justified? Even though a great deal of the traffic was invited traffic and perhaps not essential, has the improvement not been justified?

In computing the additional rides necessary to pay the cost of subways and elevateds it does not seem wholly fair to base the computation on the prevailing rate of fare on the surface lines. The relief of street congestion, greater operating efficiency, relief from delays, higher average speed of operation and better service in general are worth something, and I believe that the public is becoming sufficiently enlightened to pay willingly for such additional benefits.

As a general thing subways enhance property values, elevated lines depress values. Enhanced property values to some extent will help pay for subway construction, but the excessive cost of subways as compared to elevated lines per unit of length (approximately four times) in many cases warrants the construction of the latter even though property damages may be considerable. The present and probable future type of district must be considered in rendering a decision as to which type of construction is desirable. It must be remembered, in considering subways and elevateds, that it is not always possible to remove all cars from the surface of the street.

In any discussion of traffic questions the problem of maximum allowable speed as related to congestion should not be overlooked. It is evident that as great speed as is consistent with safety is desirable. Just what limit of speed will give the desired results is dependent upon local conditions and cannot be determined except by studies of these conditions. The adoption of the lane method of segregating traffic will materially improve the situation.

EDUCATE THE AVERAGE CITIZEN

One objective toward which we should all direct our endeavors is the education of the average citizen as to his own personal loss, even though it be only a matter of time, due to traffic conditions and to his responsibility in the relief of the existing conditions. The Cleveland Association of Building Owners and Managers has taken a forward step in this direction. As a result of the conference called by W. R. Hopkins, City Manager of Cleveland, a committee of this association has made careful surveys of traffic congestion. This organization has approached the subject with a broad and unselfish attitude. In its report it has emphasized that the streets were not designed for their present purposes, and that the immediate problem is to fit the traffic to the street. It states that all-day parking should be prohibited on all streets in congested areas and that limited parking of not more than one hour be permitted in such built-up districts, except that parking should be entirely prohibited on narrow streets and alleys. The committee recommends the appointment of a traffic commissioner with the necessary assistants who should devote their entire time to the study and improvement of traffic conditions.

The results of such an attitude by this body should be far-reaching. Complete realization by business men and the traveling public of their own part in the traffic problem and co-operation on the part of all would improve the situation immensely.

Many Committees Hold Meetings at St. Louis

IN CONNECTION with the Midyear Meeting of the American Electric Railway Association at St. Louis this week a number of important committees held sessions. These included the American executive, subjects and meetings, convention date and location, company and associate membership, insurance valuation, Transportation & Traffic executive, traffic congestion, automatic substations, purchases and stores, co-operation with manufacturers, Claims executive. Reports of these meetings are given below.

American Executive Committee

The executive committee, American Electric Railway Association, held a regular meeting at St. Louis on March 3. Members present were President B. I. Budd, Secretary J. W. Welsh, Gen. George H. Harries, W. V. Hill for Paul Shoup, W. H. Sawyer, C. E. Morgan, R. P. Stevens, J. N. Shannahan, C. L. Henry, J. H. Hanna, Harry Reid, F. R. Coates, L. H. Palmer for C. D. Emmons, H. A. Johnson, E. M. White, E. F. Wickwire, H. D. Shute, J. G. Barry, A. A. Hale and C. R. Ellicott.

Mr. Stevens reported for the finance committee. For the policy committee, Mr. Shannahan reported on the request of the Claims Association for the employment of a safety engineer for the headquarters staff. He said the budget this year does not provide for this expense and that it is the feeling that the association is not warranted on present revenues in taking such a step. He thought also that the present staff is better able to do this work than was thought by the Claims Association. President Budd commented that he doubted the wisdom of the association starting on a program of hiring specialists. The request was disapproved by the committee.

Mr. Henry reported for the committee on national relations. He spoke of the introduction of House Bill 7040 which would create a 2½-cent coin and providing that one-third of the number minted would be Roosevelt coins, one-third Harding coins and one-third in memory of Wilson. Mr. Henry desired to know the position of the committee with respect to this bill. After some discussion it was decided to refer the question to the policy committee for study and report at the next meeting.

The demand for these coins rises from the Women's Roosevelt Memorial Society and it has no business backing, it was said.

The membership, subjects and meetings, publicity and midyear dinner arrangements committees reported briefly.

Mr. Shannahan presented the recommendations of the committee on location and date of the next convention, that the convention be held at Atlantic City during the week of Oct. 6, and with exhibits. The executive committee adopted these recommendations with the proviso that they were subject to the ability of the entertainment and exhibits committees to come to a satisfactory agreement with the Atlantic City people.

E. M. T. Ryder appeared before the committee to secure approval for expenditure of the money appropriated for building a rotary joint testing machine, in making tests of another nature. The engineers had questioned whether the machine would provide reliable data, and it cost too much to build. The committee did not approve the recommendation.

Mr. Wickwire told of the latest efforts of the committee on co-operation of manufacturers and emphasized the need to keep up the work and to persist in the publicity work. Mr. Budd reinforced this by saying that any company that was not doing its part in publicity and education work was derelict in its duty to the industry and to itself. He said every railway executive ought to demand from his board of directors an appropriation for publicity and advertising purposes.

The next meeting will be held in New York on April 11. The meeting after that was tentatively set for May 8 or 9 at Cleveland in connection with the meeting of the U. S. Chamber of Commerce.

Insurance

A meeting of the committee on insurance was held on March 3, at St. Louis. Those attending the meeting were: J. T. Staub, chairman; O. H. Bemd, G. H. Bourne, B. J. Denman, C. H. Fahrney, C. E. Morgan, C. B. Scott and Paul E. Wilson.

The minutes of the meeting held in New York on Dec. 14 were reviewed. Substantial progress was indicated by the reports of the sub-committees and it is believed that a report of much value to the industry will result from the committee's work.

Automatic Substations

A meeting of the special committee on automatic substations was held at St. Louis on March 3.

Members present were: W. E. Bryan, chairman; E. H. Scofield, A. Hughes, Jr., F. W. Peters, C. A. Butcher, R. H. Rice and L. D. Bale. L. N. Van Hook later represented W. E. Bryan.

Mr. Bryan called the meeting to order and after a brief summary of the work of the committee up to date was compelled to leave due to serious illness in his family. L. D. Bale then acted as chairman pro tem.

Messrs. Scofield, Rice and Bryan presented discussions pertinent to the report. Each of these discussions was covered in detail by the committee.

During the lunch period, the committee visited the Maple and Evans Avenue automatic substations of the United Railways of St. Louis, which have just been placed in operation.

Claims Executive

President W. H. Hyland presided at a meeting of the executive committee of the Claims Association at St. Louis on March 3, at which the following members and guests were present: L. F. Wynne, J. S. Kubu, S. J. Herrell, G. T. Hellmuth, C. B. Proctor, C. B. Hardin, G. C. Hecker, T. C. Neilson, S. G. Shaw and F. H. Warren.

A letter from Mr. St. Clair of association headquarters on the subject of preparing a safety code book was read. The committee voted to approve its preparation and recommended that the parent association assign the different parts of the work to the various affiliated associations for the preparation of their respective parts of the material in such form that it could be combined, edited and published by headquarters.

It was decided to discontinue the question box as a part of this year's annual convention program. Mr. Hecker suggested that manuscripts of papers and discussions sent to authors for editing be cut to the valuable essentials in order to reduce the cost of the final proceedings. Mr. Hellmuth reported that the request of the association for the appointment and assignment of a special safety engineer was transmitted on Jan. 11 to the executive committee of the parent association, and President Hyland stated that the executive committee had decided not to make the appointment.

A motion was passed providing that the committee on subjects consist of three members, and that they be appointed for one, two and three years respectively, but giving the president power to reappoint a retiring member when necessary.

Co-operation of Manufacturers

Steps which can be taken by the manufacturers in co-operating on publicity was the subject of the discussion by the committee on co-operation of manufacturers of the American Association at the meeting held at St. Louis on March 3. In addition, new subjects for the extension of the "Traction Tom" posters for use by railways, and the posters for use by both co-operating manufacturers and railways, were discussed.

It was reported that the list of co-operating manufacturers had been increased from 137 on Jan. 11 to 157 at the present time. In approaching the manufacturers in a given community it was suggested that they could be effectively reached by the local member of the committee in some cases through luncheons at which they could be addressed collectively.

The possibilities of special publicity addressed to the local business men in a given city who are directly affected by railway operation, as for example real estate dealers, were outlined by Mr. Wickwire. This it was thought, could be very effectively handled by a co-operating manufacturer. In addition it was also pointed out that a member of the committee could frequently be instrumental in obtaining the assistance of sectional manufacturers' associations in securing fair treatment of the railways by regulatory commissions.

Purchases and Stores

The meeting of the committee on purchases and stores of the Engineering Association held at St. Louis on March 3 was attended by J. P. Dick, chairman; C. A. Harris, Harry Lloyd and W. N. Ford.

Of the three subjects assigned to this committee for study, that of determining the proper place of the purchasing and stores department in an operating company's organization was submitted in tentative form for inclusion in the committee's report.

C. A. Harris reported for the subcommittee on the preparation of a standard method of classification and sale of scrap materials. This work was carried out to fit the requirements of the average sized property. It was felt that such a classification should be made as simple as possible and should be subdivided only to the extent necessary to take advantage of price differentials on those materials which accumulate in carload quantities within a reasonable time. As a result the committee was able to prepare a tentative classification of approximately forty-five different kinds of scrap.

It was agreed that with such a classification as a working basis, the smaller properties would be able to cut down the number of items in accordance with their conditions and the very large roads would make such additions as were required to cover materials handled in sufficient volume to justify further separation. The sub-committee decided, however, to include in the report a list of the principal items of scrap materials coming under each of the classifications.

As the sale of scrap without agreement regarding time and point of final acceptance frequently leads to controversy and serious loss through rejection after loading or shipment of material, the committee was agreed that inquiries should require inspection of material before bid is made, and that such acceptance should be included as a part of the contract at the time it is signed.

Company and Associate Membership

This committee met at St. Louis on March 3 and laid preliminary plans for bringing into the association railways not now members. The work will be divided among members in various parts of the country and a mail campaign supplemented by personal solicitation. Members present were R. P. Stevens, chairman; K. A. Simmon, E. P. Waller, E. M. Walker, John Dewhurst, F. C. J. Dell and Harry L. Brown.

Valuation

The committee on valuation of the American Association held a meeting at St. Louis on March 3. Those present were F. W. Doolittle, acting chairman; W. B. Tuttle, L. R. Nash, E. J. Bechtel, W. H. Maltbie, Frank Silliman, Jr., F. M. Brinckerhoff, T. E. Francis, Mr. Bennett and E. J. Murphy of association headquarters.

Mr. Francis presented a report as chairman of a sub-committee on terminology, in which it was pointed out that there are several ambiguous and unfortunate terms in use that should be standardized. It was stated that further study will be given this subject.

It was reported by Mr. Maltbie that he sees no reason for changing the practice in reporting court and commission decisions.

A preliminary report written by Dr. Conway was read by Mr. Nash of his sub-committee, giving methods that should be used in assisting courts and commissions toward arriving at a fair idea of what should constitute a rate base.

Subjects and Meetings

This committee met at St. Louis on March 3, for the purpose of drawing up a tentative program for the next annual convention. The members present were Britton I. Budd, chairman; Frank R. Coates, Gen. George H. Harries, Edwin C. Faber, J. W. Colton, Harry L. Brown, H. A. Johnson, J. W. Welsh.

Subjects which will probably be parts of the program are customer ownership, traffic congestion, value of the railway to a community, modernization, bus and rail co-ordination, publicity. These subjects, if they remain on the final program, will be treated from a different angle than heretofore.

Convention Date and Location

Meeting at St. Louis on March 2, this committee thoroughly canvassed the situation and decided to recommend to the executive committee that the next annual convention be held at Atlantic City during the week of Oct. 6 and that exhibits be held. This recommendation was made subject to the ability of the exhibits and entertainment committees to secure satisfactory terms. This choice of the committee reflected the sentiment widely expressed throughout the country.

The members present were J. N. Shannahan, chairman; J. W. Welsh, F. C. J. Dell, Col. A. T. Perkins, W. H. Heulings, Jr., Paul Wilson, C. E. Morgan, L. W. Shugg, J. H. Hanna, C. L. Henry, J. C. McQuiston, H. L. Brown and Mr. Royal.

Transportation and Traffic Executive Committee

This committee met at St. Louis March 3 with First Vice-President T. C. Cherry presiding in the absence of President Punderford. Other members present were G. H. Clifford, J. V. Sullivan, E. M. Walker and Samuel Riddle. It was decided that hereafter questionnaires should be submitted to the executive secretary before being sent out, to prevent duplication. Approval was given to a proposal that a book covering recognized safe practices for the industry be prepared. President Punderford will be asked to appoint a committee to work with representatives of the other associations in the selection of material. Four committees reported progress. Their completed programs must be in the hands of the secretary before July 1. The committee recommended that in printing discussions of committee reports and papers at the annual convention they be briefed with the idea of saving space in the proceedings. It was also agreed to continue the practice of distributing in advance printed copies of reports to be read at the annual convention.

Relief of Traffic Congestion

The committee on relief of traffic congestion of the Transportation & Traffic Association met at St. Louis March 3 with the following present: Paul E. Wilson, chairman; D. L. Fennell, George B. Anderson, W. E. Thompson, W. H. Maltbie, H. O. Butler and J. V. Sullivan, sponsor. The traffic situation in various cities was discussed at length and all felt that this was one of the most pressing problems for practically all companies. A form of inquiry was decided upon, this to be sent out at once so that replies could be tabulated in the near future with the idea of then agreeing on recommendations. The committee was aided in its appreciation of the problem by the discussion at the session of the Midyear conference the following morning.

City and Interurban Operation

The committees on city operation and interurban operation met jointly as the guests of Harry Reid, president Interstate Public Service Company, on March 1. The meeting was held on one of the company's new dining-club cars, which was operated out of Indianapolis, luncheon being served en route. The car was then run onto a siding near Franklin, Ind., during the meeting, afterward returning to Indianapolis.

Those attending the meeting were, for the interurban committee, Harry Reid, chairman; V. W. Berry, John Bleecker, Samuel Riddle, G. W. Welsh, H. A. Mullett, C. E. Thompson, J. C. Schade and Frank Blanchard; for the city committee, R. F. Carbutt, acting chairman; R. W. Emerson, F. C. Chambers, C. D. Porter, W. E. Wood, E. J. McIlraith and R. N. Graham representing C. S. McCalla; joint members, W. V. Hill, E. F. Wickwire and G. C. Hecker, secretary; guests, Charles L. Henry, J. P. Stewart, M. B. Lambert, James W. Welsh, Morris Buck, Bert Weedon and L. M. Brown.

Chairman Flowers of the city operation committee was unable to be present, and at his suggestion Chairman Reid presided over the joint meeting. Mr. Flowers also had designated Mr. Carbutt acting chairman of the city committee. Announcement was made of the addition of D. W. Snyder, Jr., to the interurban committee as a member-at-large.

A new assignment by President Budd was announced, to review each year the developments and improvements in equipment that the studies have indicated would be helpful to the industry.

Replies were received from several Canadian companies indicating a desire to co-operate in the work of these committees. Mr. Lambert suggested that three members-at-large for Canada be added to each committee to recognize the Canadian members of the association for the balance of this year, and to formulate a plan for properly including the Canadian territory next year. The suggestion was approved. A letter was read from the Honolulu Rapid Transit & Land Company also agreeing to co-operate. This territory was added to Mr. Hill's assignment.

It was the sense of the meeting that wide publicity should be given the work of the committees, and that arrangements be made to publish reports prior to the annual convention.

Progress reports were made by the regional vice-chairman of the committees of visits to properties in their respective territories. A number of them already have made such visits and have found practices worthy of note, covering a wide range of subjects. Personal visits were felt to be necessary to secure the desired results. It was found that there is considerable lack of knowledge on the part of operating men of the information available at association headquarters and in the technical press.

Mr. Carbutt reported that he has found it of advantage to prepare what he terms an operating handbook, containing an outline of the committee work and the general subjects to be considered. He has the intention of sending to a property in advance of his visit a sufficient number of copies, so that each operating official may have one. These men will be requested to prepare one-page statements of any developments considered of outstanding interest or value to the industry. This will save a great deal of time, and he will then be in a position to determine what further detailed studies may be necessary on any property. Mr. Carbutt stated that he had had a conference with the editors of ELECTRIC RAILWAY JOURNAL and that he had prepared a classification based on the subject index published semi-annually in this paper.

Some question was raised as to the scope of the committees. It was felt that no encroachment should be made on the work of other committees, but that the principal value of this investigation consisted in finding practices of outstanding merit and broadcasting them to the industry.

Mr. Henry stated that he was pleased with the work of the committees thus far. He felt that the main thing now is to prepare a means for co-ordinating and disseminating the information developed. Assurance of the assistance of ELECTRIC RAILWAY JOURNAL in this was given by Mr. Buck, who said this paper would be glad to publish any suitable material and to prepare for publication more detailed information on particularly interesting features.

The Improving Financial Condition of the Electric Railway Industry

This Subject, Which Was the Topic of the Afternoon Session of the St. Louis Meeting, Was Discussed from the Viewpoints of the Investment Banker, the Economist and the Holding Company

THE afternoon session took the form of a symposium, the topic being the improved financial condition of electric railways. J. K. Newman, from the standpoint of the investment banker, urged greater publicity to tell the public what has been accomplished in the way of progress and to dispel many false notions that have been accepted by the public. Prof. Richard T. Ely, one of the most noted economists in this country, pointed out the large ratio of investment to revenue, and the difficulty of reducing costs. He felt, however, that there is a decided change in the attitude of the public and of the industry, and that if the industry keeps on with its program of modernization it will come out all right. The holding company's position was outlined by B. C. Cobb, who showed how the securities of the railways have fallen from the favor of the public, and how they are even now establishing a better credit basis. All of the speakers expressed faith in the future, feeling that the industry is fast approaching a period of continued prosperity.

Investment Banker Sees Prospect of Better Financing*

By J. K. NEWMAN

Newman, Saunders & Company, Inc.
New York

THERE are cycles of activity for securities of various classes. When the cycle of activity is strong for a special class of securities, a buying fever may spread like an epidemic and likewise run its course. If the investing public is not interested, it is difficult to dispose of any securities.

When we think about the present inability of street railways to dispose of their securities, it would seem that the principle of cycles of activity and the principle that the price of commodities averages a reasonable profit over a period of years are in danger of being disproved. For years, there has been practically no offering of exclusively street railway securities by investment bankers. Looking back into the palmy days of street railway financing, it will be recalled that good street railway securities were absorbed freely and the cycle of activity lasted for years. The question is, when will the cycle return? The public is not concerned whether street railway securities can be sold or not, though it is dependent on such sales for efficient service. It must be made to understand this and also many of the street railway conditions, good and bad, before confidence in such securities can be restored.

The present state of mind of investment bankers and private investors shows many false notions against street railways. These are based on fear, with more than a sprinkling of ignorance, and with some absence of vision. It will be helpful to enumerate these indictments, as follows:

GREATER PUBLICITY is urged as a means of telling the public of the improved status of electric railways as investments. The public has several false notions detrimental to the industry that should be removed. No better evidence of improving conditions can be given than advanced prices for securities already issued, and better terms on which new issues have been floated.

1. Franchises with low fixed fares are known to be unprofitable.
2. Service-at-cost or other form of eliminating a fixed fare is considered only a temporary expedient.
3. Resistance to increased fare is a popular issue for political exploitation.
4. The menace of jitney competition still lingers in the minds of investors.
5. Bus systems are feared as a substitute for street railway systems.
6. The growth of private automobiles is believed to be reducing car riding.
7. Numerous receiverships and reorganizations have made investors skeptical regarding street railway securities.
8. Inability of street railways to sell additional securities or refund maturities has produced a lack of confidence in existing securities.

In the early days, investment bankers would not entertain the purchase of street railway securities unless the franchise contained a fixed fare, usually 5 cents. The fare provision, however, was the one condition above all others which caused the serious setback to street railway securities. The cost of operation soared and the 5-cent fare became unprofitable; and yet the public clung to it with a fury that equaled the determination to win the war.

Although bankers were keen to buy railway securities and the companies enjoyed what they supposed were satisfactory profits, the 5-cent fare was never really profitable, taking the business as a whole. The street railways were then placed in a position somewhat similar to that of a manufacturer who had sold his output for a period of years at a fixed price and who found that his business was being ruined by it. The manufacturer had to submit to his loss, and often bankruptcy resulted.

Unlike the manufacturer, the street railways could not go out of business without injuring every other kind of business within the territory served. Yet they were compelled to have profits which would permit the property to serve the public efficiently and permit the raising of new capital for expansion. There was only one solution, which came through the wisdom of state governments in creating public utility commissions, which adopted the practice of first determining a fair valuation or rate base. With the value or rate base determined, the regulatory bodies have allowed a fair return, which varies, though it is never too high. In some instances, and properly so, the rate of return went up as the fares went down, or an incentive in some form for good operation was granted. While those decisions by the commissions forced the street railway to live on a restricted diet, nevertheless this policy gave a stability which should be and will be the foundation of a cycle of activity for the securities of street railways.

If the public is to become interested in utility securities, it is necessary that there should be greater publicity by the street railway companies to explain these economic changes and the stability produced by a fair return on a fair valuation. The public must know that this adjustment is a permanent one, and supersedes the fixed fare.

---

*Abstract of paper presented at the Midyear Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

The effective impression made by demagogs who still believe they can get political support by clamoring for a 5-cent fare is a serious handicap. These demagogs, with few exceptions, know that a 5-cent fare is no longer possible, but they hope to fool the public for their own ends. Publicity should persist on the part of the railway until the public learns that it is getting the fairest deal in America from street railways generally.

The efficiency and the practical use of jitneys have been largely exploded. It is gratifying that in many cities the people have voted against jitneys and eliminated them. However, it will take some time yet for investors to forget the menace of jitneys and to realize that jitney competition is unfair and has about reached its end.

Some investment bankers and public investors fear that bus systems will supplant street railways. This is possible only if the cities enjoying street railway systems are willing to cause one of the greatest financial disasters this country has ever experienced. Think what it will mean if the six billion dollar investment in street railways is to be destroyed, for there would be little salvage from the property. Aside from this investment loss, what would be the financial effect on the cities if street railways were discarded? Street railways pay taxes varying from 5 to 10 per cent of their gross receipts, and in addition, for a vast amount of paving. Many cities would face serious financial problems or disaster if they could not collect these taxes and besides had to pay for and maintain the paving now paid for and maintained by the street railways. Furthermore, the public would have to pay fares considerably in excess of the present charges, because buses cannot operate so cheaply as a system of street railways. If the proper explanation of the competing bus system with its higher fare and low taxes and no paving obligations is fully explained to the public, these competing systems will not be permitted.

The bus manufacturers realize that their best customers are the street railway companies. These manufacturers do not desire to put in competing systems or to help others do so, but they have buses to sell and they look to the street railways to be the buyers.

The private automobile has undoubtedly affected street car receipts. However, the large increase in privately owned cars has not been without its advantages to street railway systems. The number of passengers carried by street cars for the last ten years clearly indicates there has been a large and steady increase, but for the last two or three years, this upward trend has flattened considerably, though it is still climbing. The private automobile, to some extent at least, helped the street railway companies to avoid expansion for which money could not be obtained and from which there would have been no profit over the cost if obtained.

Street paving required of street railways already has been mentioned. Under present conditions, private automobiles are dependent upon this paving and they should pay for it to some considerable extent. They can do so through taxes.

The public is beginning to realize that the private automobile should not be permitted to interfere with street car traffic. Regulation is growing stricter and more efficient from day to day.

Receiverships and reorganizations have made investors skeptical, but it is not generally appreciated how helpful is the law of receiverships. Street railway companies during the war were in many instances handicapped with two forms of contract impossible of performance. The one was the fixed fare, the other the contract with security holders where the capitalization was not predicated upon the basis of restricted net earnings. Receiverships were naturally forced upon the companies by these conditions, and with the property in the hands of the courts increased fares were granted to offset increased costs.

These receiverships also enabled the companies to change their financial setup. Reorganizations followed, bonded debts were adjusted to a sound basis and stock capitalizations were rearranged to make securities safe and dependable. Receiverships are terminating rapidly and the companies are going back into normal operation greatly improved from the experience.

Publicity is all-essential. This publicity, primarily, must be conducted locally and must be comprehensive in its educational scope. Street railway companies have resorted to publicity, but not sufficiently so. However, this local publicity must be handled carefully. It is not only necessary that it should be absolutely honest; it must be tactful and intelligent. Unfortunately, there are not many trained publicity experts in this business such as are found in the department stores.

As publicity grows and its results are observed, it will expand of its own momentum. Naturally, there are degrees of publicity required according to times and conditions. Until the public knows the real story of the street railways, a super-effort is necessary.

Therefore, reach out for a larger fund to supplement local publicity and for a national program. The result then will be quicker, and in two or three years homeopathic doses will answer; a major operation is required now.

Street railway financing is on the way and the outlook is hopeful. With few exceptions commissions have given final valuations and have allowed fares which will insure a sustaining return. Jitneys are fast becoming a thing of the past. Bus systems can be made an asset instead of a menace. Private automobiles will be regulated and taxed and thus be a medium of getting relief for the street railways from the paving burden. Receiverships have made it possible to eliminate impossible fare conditions. Reorganizations will result in the issuance of better bonds and the elimination of over-capitalization. Lastly, and best of all, two large issues of street railways bonds have been successfully floated by investment bankers within the last two months. Investment bankers are like sheep, though never sheepish; they follow the leader. No better evidence of the improved conditions of street railway investments exists than the advanced prices for bonds and stocks already marketed.

*Economist Sees New Era Ahead for Electric Railways**

By RICHARD T. ELY

Director of the Institute for Research in Land Economics and Public Utilities, and Professor of Economics in the University of Wisconsin

IT CANNOT be overemphasized that the point of view of an economist is the public or social point of view. His objective is promoting the general welfare. Since my subject is the financial condition of electric railways I therefore necessarily consider that condition in its relation to the financial and industrial structure of the whole country, for unsound financial conditions in one or more basic industries may disturb our entire prosperity as a people. Does not agriculture today afford ample proof as well as illustration?

First of all, what do we mean by the financial condition of any business? The financial condition of any business or of an industry is a result of the relation of expenses to income in that business or industry for some extended period of time. The net income is thus the dominant single fact behind which are assembled all the causes that affect favorably or unfavorably any enterprise.

SOME CONSEQUENCES OF BAD FINANCIAL CONDITIONS

When net revenues decline so that they barely cover interest and taxes no capital is available from the industry itself. Moreover, its power to draw funds from the outside at reasonable rates of interest disappears. As the margin of revenues over expenses becomes even smaller, less and less is set aside for depreciation, because that constitutes one of the expense elements that can be deferred. There soon appear inevitable concomitants of such financial conditions. Service deteriorates and the public begins to grumble. Necessary improvements are not made, so that the property begins to look run down at the heel. Capital for extensions it not available, and hence the property fails to keep pace with the needs of the community. In this way inadequate financial resources make it impossible for an industry to supply the services for which the social economy has intended it. Other industries dependent upon its buying power suffer and languish proportionately. In truth, economically as well as morally speaking, we are all members one of another. This is the principle of social solidarity, one of the profoundest and most pregnant of all social principles and one which has daily increasing significance as economic evolution proceeds. Yet the crux of the whole matter for our present discussion lies in the relation of expenses to income. The situation can be relieved only by increasing the income or reducing expenses or both.

---

*Abstract of paper presented at the Mid-year Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

PRESENT CONDITION RESULTANT OF COMPLEX HISTORICAL CAUSES

The existing financial condition of the electric railway industry has been the result of a long development. The causes are not all to be found in the war period, but must be traced in the history of the industry and in the history of regulation. Historical analysis must be made of the difficulties in order to disclose where, when and how remedies can be intelligently applied. Unfortunately, the electric railway is first of all a local public utility and hence has its economic roots in local soil. This gives the problem great variety and complexity. It has certain general aspects, it is true, especially as the area of operation expands, but real understanding can only flow by taking into account primarily local conditions and variations.

But the financial condition of electric railways is improving. While we cannot say that the dark clouds all belong to the past and sunshine only is promised for the future, I do believe it safe to say that the period of the greatest difficulty appears to have been passed. As Mr. Budd has indicated, the progress is reflected by increased riding on both urban and interurban lines and by great gains on interurban freight business. Yet the lessons will have been in vain unless the experiences gained are consolidated. One result should be a quickened interest in and response to proposals for the scientific study of public utility problems, for the active encouragement of both the collection of facts and their wide dissemination through scientific agencies. After all, public education and self-enlightenment are the best insurance policies against social calamities.

Certainly prior to the summer of 1919 agriculture and transportation were receiving relatively little consideration, and they were the subject of very little public concern. Yet these are the two industries that have suffered most from the war and postwar conditions and have constituted the greatest menace to the financial stability and prosperity of the whole country. Curiously enough, the prime cause of the financial difficulty in the two industries has been of an opposite character: In the case of agriculture we have an industry of extreme individualism, in which competition controls and individual productive effort is unregulated and undirected. In the case of the transportation industry, and more particularly in the case of the electric railways, we have an industry which has been subject to extremely rigid and sometimes unwise regulation. So far as popular clamor of that sort is concerned, generated by ignorance on the one hand and demagoguery on the other, it is hard to say which has been the more fruitful field, but I think that electric railways will have to yield to agriculture in this respect.

HIGH FIXED CAPITAL and large proportion of labor expense are distinguishing features of railway operation. Sound franchises and sufficient revenue must be provided if the industry is to grow and prosper. The author holds that the present new era in economic evolution necessitates a complete overhauling of our ideas of taxation.

If we were to analyze the conditions that, more than any others, determine the relation of income to expenses, we should want to present them under these headings:

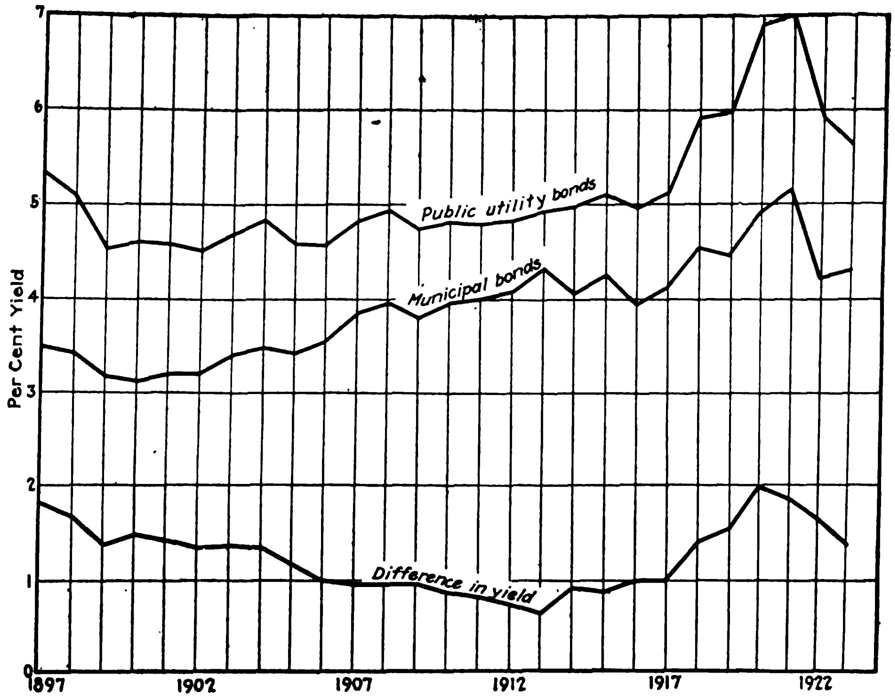
1. *Economic Conditions Inherent in the Nature of the Industry.*—Here and now I want to call attention to the relatively large investment of fixed capital, carrying along with it a very large and relatively fixed overhead. Operating expenses are the chief item here. As they are relatively constant, a situation arises in which net income varies sharply with the ebb and flow of traffic. This makes the industry peculiarly susceptible to changes in business conditions and to the inroads of competition.

In the case of growing prosperous companies, points are reached in their development when additional capital expenditures become necessary in order to provide additional plant capacity. These are always periods of economic storm and stress.

Another inherent characteristic to which attention would have to be directed is the large proportion of the wage element in the annual expense account, and the inherent inability of the industry to economize in this type of expenditure by substituting for it a capital charge. Wages constitute in the neighborhood of 46 per cent of all electric railway operating expenses. This was shown to be a peculiarly vulnerable point during the recent period of rapid and substantial wage increases. Incidentally it may be observed that electric light and power companies are in a far better position to reduce labor cost by capital expenditure and so are steam railways.

A table prepared from census figures gives some indication of the changing magnitude of supply of electric railway facilities as shown in miles of single track operated, the changing magnitude of traffic flow as indicated by revenue passengers and the degree of economic utilization as shown by passengers per mile of single track. The statistics are characteristic of industries where the supply of facilities has outrun existing or potential demand. The practical cessation of expansion since 1912 is gradually bringing about a situation of equilibrium.

The development of the private automobile has undoubtedly been the reason why potential demand as shown by population growth failed to materialize. The situation promises to



Comparative Average Yield and Difference in Yield Between Twenty-five Public Utility Bonds and Fifteen Municipal Bonds, Average of Four Months—January, April, July and October, Annually, 1897-1927

CHANGING MAGNITUDE OF ELECTRIC RAILWAY OPERATIONS
U. S. Census Returns

Year	Miles Single Track	Revenue Passengers	Revenue Passengers per Mile Single Track
1890	8,123	2,023,010,202	249,047
1902	22,577	4,774,211,904	212,217
1907	34,375	7,441,114,508	216,522
1912	41,033	9,545,554,667	232,556
1917	44,808	11,304,660,462	252,323
1922	43,905	12,665,300,050	288,471

stabilize itself by making the electric railway in urban centers an agency for mass transportation, with the motor bus giving supplemental service.

There is no basis for the suggestion that one often hears that the electric railway is a "dying industry." While motor bus traffic will increase, the comparative costs and convenience of the two types of conveyance are not such as to justify the prediction that the one will supersede the other.

2. *Management of the Individual Business Unit.* — Under this heading would have to be put the sum total of the devices and policies the management adopts in order to make a given expenditure bring the maximum of return in service units. The stress of circumstances has certainly furnished an incentive to all manner of economies. Criticism from within and without the industry, combined with a final breakup in the cake of custom that was threatening to encrust the industry, has brought on a new spirit among those manning these enterprises.

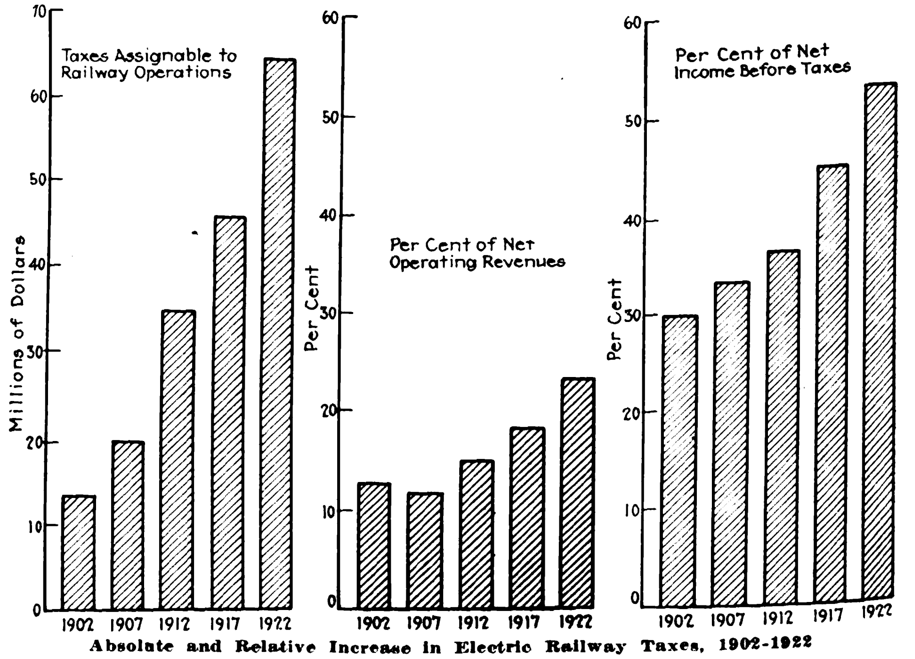
3. *Legal Requirements that Condition Income and Outgo.*—You have all been painfully aware of the fact that the industry in which you are associated is one in which prices are controlled by public authority. This has deprived you of a desirable flexibility in adjusting your price schedules to what you might otherwise have regarded as good business. You have been fortunate if you were able to bring your case to the attention of a regulating authority with the power to make necessary adjustments. In many cases you may have been face to face with inflexible rate provisions in franchise contracts entered into at a time before the recent price revolution. Other difficulties of the same general origin may have arisen because of the uncertain tenure of your franchises. The requirements of a public policy, deemed wise in the past, may have placed upon your properties the burdens of special taxes and special imposts. These legal requirements should not, in an enlightened community, be anything more than the sane premises in which the public interest in adequate service at reasonable rates finds its reconciliation with the private interest in an economic livelihood for each of the co-operating producers, as well as their joint interest in the financial health of the entire going concern. As in the case of policies of management, there is large scope here for the possibilities of working improvements in public policies of control.

4. *Conjunctural Elements Conditioning Income and Outgo.*—In economic life what we call conjuncture plays a large rôle, but it has not as yet received the scientific treatment that it deserves. Under conjuncture we understand what we may loosely designate as luck and chance. While we deal here with a group of causes over which we have little control, we may be able to soften down the effect of these causes and provide for flexible accommodation to them, thus escaping their baneful influence. The war emergency was such a conjunctural element, foreseen by no one, yet vitally affecting all. All economic activity was borne upon a crest of advancing prices which did not definitely subside until the spring of 1920, and then with disastrous effects. Minor disturbances, such as the influenza epidemic of 1918, may come in to add their share to your troubles. And in the specter of business depression and consequent unemployment you meet an old enemy whose coming is none the less uncertain, though you have met him often. Last, but not least, is the gradual conjunctural change which has been quietly shifting the entire basis of your business, namely, the perfection of automotive equipment, so that there stands at your elbow all of the time the possibility of competition from substitute service. This is a form of competition against which no certificate of convenience and necessity can or should afford protection. It is one of the risks inherent in all enterprise. Yet proper public policy and flexible management policies can do much to help even here.

OUTSTANDING REMEDIES

Among the remedial conditions which past experience has suggested, two stand out above a host of others. The first concerns the conditions under which the utility is operated. If the mistakes of the past have made clear one thing, they have shown that competition among like or substitute agencies of transportation must be eliminated. We have as a people become so accustomed to look upon competition as an automatic solvent of our economic problems that we cannot readily accept the thought that monopoly operates as a beneficent principle of organization, making possible on the one hand the conservation and marshaling of productive capacity and on the other hand the governmental limitation of profits to a reasonable amount. In fact, instead of less monopoly we should introduce more monopoly, even to the point where we get complete integration of the supply of local transportation, by whatever agency performed. Strict and detailed regulation must accompany such monopolistic grants. Wherever possible the grants should be, like the character of the function performed, indefinite in duration, with public ownership and operation as a permanent possibility under conditions protecting vested property rights. The operating agreement contemplated between the city of Milwaukee and Milwaukee Electric Railway & Light Company is one that strikes out along these lines, and is worthy of close study by members of this association.

The second remedial condition relates to the instrumentalities by which prices are adjusted. There can be no flexible accommodation to causes over which management has no control, unless there is adopted the principle of what we economists call the necessary supply price. This means that we must so adjust rates and charges as to produce in a free community the service desired. Enough must be paid to purchase labor, skill, talent and capital for the type of service demanded. If extensions are desired, revenues must be sufficient to secure needed capital and other requisites in the open market. We cannot get something for nothing. Even where the adjustment of rates is avowedly based upon the necessary cost of the service, as in certain service-at-cost contracts, there must be an unflinching application of the principle as was done in Boston, and was not done in Cincinnati, in order to bring the individual plant into an economic position where it may fulfill its social function. Prices must change as the reasonable cost of rendering adequate service changes. In fact, reasonable



Absolute and Relative Increase in Electric Railway Taxes, 1902-1922 cost under monopoly, where the service rendered is a necessity, is the only basis left for price adjustment. This result can best be obtained under flexible rate franchises or else by the method of continuous regulation by commissions.

With these remedial conditions in effect, any urban electric railway will have gone a long way to bring about that reasonable balance between income and outgo which alone can establish sound financial conditions. That there is promise of a return to good financial conditions is shown by the credit standing of public utilities in general, as well as of electric railways in particular.

Studies of the Institute for Research in Land Economics and Public Utilities in the credit of electric railways show that the price of electric railway bonds increased more proportionately from 1922 to 1923 than those of any other class of utility. This is shown in the accompanying chart.

The weighted average yield, based on offering price, of substantially all security issues by electric railways, exclusively, was 6.40 per cent for 1922. In 1920 the average weighted rate was 7.92 per cent for exclusively electric railway companies. Railway and electric company securities issued in 1920 were offered at a weighted average yield of 7.82 per cent. In 1922 the comparable figure was found to be 5.91 per cent.

Compared with the rate at which the largest cities can borrow, the credit of public utilities also has improved. In 1920 there was an average difference of about 2 per cent in yield, in 1923 the same bonds yielded less than 1.5 per cent more than the bonds (tax exempt) of our larger cities.

Within the recent past, two clouds have appeared upon the financial horizon of electric railways. The first concerns the very rapid and heavy increase in the burden of taxation, and the second is centered in the high cost of financing experienced by electric railways in the recent past with the prospect that future refunding operations will likewise increase the interest burden. While neither of these is by any means the largest element in the financial budgets of electric railways, the large public interest connected with them and their exposed position has made them the subject of a good deal of public comment. For these reasons the Institute for Research in Land Economics and Public Utilities has made them the subject of special research. While we have not as yet completed our work, certain facts are already beginning to stand out.

First, as to taxation, the accompanying chart and table based on census data show absolute and relative increase in electric railway taxes in the years 1902-22.

ABSOLUTE AND RELATIVE INCREASE IN ELECTRIC RAILWAY TAXES 1902-1922*

Year	Taxes Assignable to Railway Operations	Per Cent Increase	Per Cent of All Expenses	Per Cent of Net Operating Revenues	Per Cent of Net Income Before Taxes
1902	$13,078,899	....	5.95	12.4	30.0
1907	19,755,602	51.1	5.07	11.8	32.9
1912	35,027,965	77.3	6.68	14.9	36.1
1917	45,756,695	30.6	6.79	17.8	44.8
1922	64,788,315	41.6	6.53	22.4	53.2

* Compiled from reports of the Bureau of Census on Electric Railways.

Comprehensive studies have been made of the burden of taxes upon electric railways in two states, New York and Wisconsin. The New York figures show the following:

RATIO TAX ACCRUALS TO NET INCOME (BEFORE DEDUCTION OF TAXES) FOR ELECTRIC RAILWAYS IN NEW YORK STATE*

	Per Cent		Per Cent
1912	31.11	1915	38.56
1913	35.55	1916	37.05
1914	36.64	1917	49.43

* Report of special joint committee on taxation and retrenchment, March, 1922, page 307.

The ratio of aggregate state and local taxes on electric railways in New York state to aggregate net income before deduction of taxes for the ten-year period 1911-20 was 56.5 per cent, as given in the report of the special joint committee on taxation and retrenchment.

The following table* shows per cent of income receipts from all sources devoted to taxes and dividends:

COMPARISON OF TAXES AND DIVIDENDS—PER CENT OF INCOME OR RECEIPTS FROM ALL SOURCES DEVOTED TO TAXES AND DIVIDENDS

	1907	1912	1917	1922
Taxes	4.6	6.0	6.3	Not available
Dividends	6.2	8.8	6.6	Not available

That is, stockholders very nearly shared half and half with the government.

But it must be clear that no conclusion can be drawn from the mere increase in taxes or even the relative increase of that as compared with other items. In the end the problem is one of equitably and scientifically distributing the burdens of government. Our constitutions generally require equalization, and our administrative commissions are making progress in this direction. But tax methods have been so variegated that it is difficult to get at the quantitative effect of the different plans. We are making such a quantitative study in Wisconsin and are getting some results which we already expected and some which we were not prepared for.

It is clear that if we wish the financial condition of electric street railways to continue to improve we cannot afford to neglect to consider the whole question of taxation, which has become so enormous a load that it is a crushing burden, unless every one bears his share. This is so large a subject that I can offer only a few suggestions. Let me state a general conclusion:

The present is a new era in economic evolution requiring an entire overhauling of our ideas of taxation and a new program with respect to the expenses and revenues of government. The magnitude of public expenditures in itself suggests that old methods are inadequate. When the expenditures of government were small and taxes were an almost negligible burden to the taxpayer rough-and-ready methods of raising revenue, while not satisfactory, did not involve intolerable burdens.

There was a time in American history, and that so recent as the latter part of the nineteenth century, when the disposition of surplus revenue constituted an outstanding problem of federal finance.

Instead we are now living in a period of heavy taxes and greatest public expenditures. Let me give the facts as succinctly as possible.

1. It has been estimated that as high as one-seventh of our income is paid out as taxes directly or indirectly[1].
2. Total per capita taxes have risen from around $23 in 1912-13 to about $80 in 1920-21[2].
3. The total ordinary receipts of the federal government have increased from about $700,000,000 in the years immediately before the war to over $5,500,000,000 in 1921.
4. Receipts of state governments have increased from a $300,000,000 level before the war to over a $500,000,000 in 1919 and probably to much higher figures in 1923[3].

An increased proportion of these tremendously increased revenues has been raised by direct taxation.

Statistics compiled by the Institute for Research in Land Economics and Public Utilities show that in 1910 only 3 per cent of our federal revenues was secured from the levy of direct taxes, whereas in 1920 approximately 60 per cent was secured by direct taxation.

GOVERNMENT EXPENDITURES INCREASING

The oldest man in this audience cannot think back to a time when he did not hear regularly in political campaigns the slogan, retrenchment and reform. Long before I was born candidates of political parties in state and nation regularly began to promise reduced public expenditures to be followed by reduced taxation, and without interruption the public expenditures have increased.

The true underlying cause of increased and increasing public expenditures is found in the development of state and nation as co-operative institutions for promoting the general welfare. More and more our wants are satisfied through public agencies, and to an ever-increasing extent there is a growing regard for the needs of the great masses of the people. The ordinary man, woman and child receive ever-increasing benefits from public agencies. Let us express this truth in these words: *The service idea of government is gaining ground day by day. It is coming to dominate all other ideas. It finds expression in public expenditures.*

---

*Taken from the Census Report, Electrical Industries 1917, page 64.

[1] National Industrial Conference Board Report No. 55.

[2] Ibid. ($88.37 in 1922 Census Bureau, as stated in Chicago *Tribune*, Jan. 20, 1924.)

[3] In 1922 receipts of state governments were $867,468,000, an increase of 183 per cent over 1912—Census Lureau as reported in Chicago *Tribune* of Jan. 21, 1924.

This great and ever increasing load of public expenditures requires an entire overhauling of our ideas of taxation. The burden is crushing, unless everybody puts his shoulder under the load and helps to carry it. The tendency in recent years, however, has been to concentrate the burden upon a portion of the community through direct property taxes and income taxes. Census figures show that in the case of the federal government the percentage of ordinary receipts from income and excess profit taxes increased from 3.10 in 1910 to 57.92 in 1921.

We have come to a time when, in the interest of the people, further progress must be met by indirect taxation, supplementing the direct taxes. It remains to work out in detail a system of taxation in which direct and indirect taxes will find their proper place, and in which the service idea of government will find its support in universal contributions to the burdens involved in the extension of the service that the government can render.

In a system of indirect taxes will be included certain sales taxes like the one on gasoline, which is as just and fair a tax as was ever devised. Amusements will be taxed; expenditures for tobacco and other superfluities will include contributions to the public purse—small in each instance, but aggregating large amounts. These taxes paid day by day in small sums will be an easy burden to bear. They will enter into the general expenses of living, and adjustments will be so made that no one will carry a too onerous burden. There will be no discontent, unless it is artificially aroused.

HOW ELECTRIC RAILWAYS CAN GET RELIEF

In conclusion, just a few words more about remedies. Electric railways must be relieved from the competition of tax-exempt capital, and relieved further from the competition of other agencies of transportation publicly "subsidized" and not bearing comparable taxes, and, third, must be freed from competition of unregulated agencies of transportation. The one measure will make the future of electric railways more secure and certain, the second will result in a more equitable distribution of the tax burden and the third will make it possible for this industry to obtain capital at more reasonable rates.

But most fundamental of all is education for good will and knowledge, both within and without the electric railways. Those in the industry deserve praise for the masterly way many of the leaders are attacking these problems. They must continue what they have begun. Most difficult is their task, handling as they do the actual physical bodies of their patrons, often under most trying circumstances. They must be more than just and fair. They must put themselves always in the other fellow's place and must have, as an ideal of courtesy and consideration, the best manners of the best department store, engaged in fierce competition. It is the little things that count—manners more than money in getting rid of old ill will and building up new good will.

---

*Holding Companies See Progress in the Industry**

By B. C. COBB

Vice-President Hodenpyl, Hardy & Company, Inc., New York

THE ELECTRIC RAILWAYS are buying more materials for maintenance, extensions and improvements than in recent years. Preliminary figures indicate that more passengers were carried in 1923 than ever before and that riders who forsook the street car for other vehicles are now coming back. Attention was called to some recent successful electric railway financing.

YOU probably have already heard or have read that the electric railways bought more new equipment in 1923 than in any year since 1913; that approximately $282,000,000 was expended last year in the purchase of materials for maintenance, extensions and improvements. Of this amount about 64 per cent was used for new equipment, extensions and improvements. You have also probably heard that the estimates for expenditures of similar character in 1924 amount to approximately $262,000,000. The expenditures thus made and proposed are one reflection of the improvement that has been going on in the business in which we and the public are so vitally interested.

The 1923 annual reports of all companies are not available at this time, but preliminary figures indicate that the electric railway industry in 1923 practically succeeded in holding the gain in net earnings made in 1922—the best year it has had since 1916. Preliminary figures also indicate that nearly 16,000,000,000 passengers were carried, thereby smashing the previous high record of 15,337,000,000 made in 1922.

I suppose there are some who think net earnings in 1923 should have shown a gain over 1922 because of the increase in the number of passengers carried. While this would have been nice, and we all would have been pleased, still I am not in accord with the thought, nor chagrined that we did not come through, and I will tell you why.

At the beginning of 1923 there were prospects of another period of inflation. The trend of commodity prices was upward, feverish speculation in general building operations was going on, and demands for higher wages were being made on all sides. For a time it looked as if the old vicious cycle of advancing prices and advancing wages would soon again be in full swing. Fortunately this movement was partially checked before it got far out of bounds. Nevertheless, many electric railway companies found it necessary to make wage advances and in many ways increase their other expenses. Obviously these increases had an unfavorable effect upon operating costs and ate into the net earnings which might otherwise have been expected. Despite these additional handicaps the net earnings of the industry as a whole, as previously stated, were practically equal to the earnings shown in 1922. I consider this an accomplishment of which we may well be proud.

Another thing—and it is important enough to repeat—the electric railways not only carried more passengers in 1923 than in 1922 but they carried more passengers in 1923 than in any year since the industry was born.

It is significant that this record was made in the year that automobile production reached its highest point. It is doubly significant, for the 1923 record of the electric railways proves conclusively the economic need of the service rendered—the cheapest and most dependable form of public transportation that has yet been devised.

"High-sounding words," some of you may say, "but the amount of net earnings left after all charges are made is what interests us." Quite right, it interests me too, and I have spent many hard days and some sleepless nights in contemplating ways and means for increasing net earnings to a point where they would show a fair return on the value of the property used in serving the public. That is our goal, and we are going to reach it notwithstanding that at times it seems as illusionary and as far off as the mythical pot of gold.

When my mind goes back ten years and I picture the situation at that time, I recall that electric railways were in high favor with the public and their securities were in demand by investors. Why? Because the electric railways then had what was considered the exclusive right to carry on an indispensable form of public service, the charge for which was fixed for a long period of time. This was considered an advantage, for while operating costs might rise slightly, it was thought the growth of population would increase traffic to such an extent as to offset any serious inroads upon net earnings. Again, fixing the rate for a long-time period was supposed to protect the companies. It forestalled political interference and prevented enthusiastic rate regulators from making trouble. The situation was simplicity itself, and the operators as well as the investors felt little concern about the future.

---

*Abstract of paper presented before Mid-year Meeting of the American Electric Railway Association, St. Louis, March 4, 1924.

Then came the war, inflated costs, and other difficulties. Don't shrug your shoulders—I am not going to drag you through that "chamber of horrors," but if any one had told us ten years ago what the electric railways were going to be up against I venture to say there are mighty few who would have thought the industry could survive. The fact that it has not only survived but has gone forward after all the hammering it has received shows the inherent strength of and the necessity for the business.

Every serious illness, unless death intervenes, is followed by convalescence. Then, if one's constitution is sound, comes full recovery. The more serious the illness the slower the recovery of the patient. The important consideration, however, at all times is whether progress is being made. So it is with the electric railway industry. It passed through its serious illness and recovery set in after 1918.

What one really wants to know about electric railway operation is whether the trend is in the right direction—I mean, is the trend toward increasing traffic and increasing net earnings; and if so, is this trend going to be permanent? This sounds so commonplace I suppose you think I am going solemnly to tell you next that "water is wet." From the variety of opinions I hear and read I sometimes wonder whether those people who bemoan the future of electric railways would not also try to prove that there is no moisture in water if the fact were not so self-evident.

I do not claim any gift of prophetic vision, nor do I pose as a soothsayer. Nevertheless, and notwithstanding numerous perplexing problems which are pressing for solution, I ask you in the name of common sense—is there any likelihood during the next ten years of a repetition of all the "hell" the industry has endured during the past ten years?

"Automobile," you say. All right! I grant that it has diverted a lot of passenger business and that it has financially crippled some electric railway companies, also that here and there it may do so again. It is my guess, however, that the worst effects from this form of competition have been seen.

Automobiles are going to be manufactured this year and the next and for many years to come. There seems to be no saturation point in so far as ownership of cars is concerned, but as I see it there is fast developing a saturation point of another character, viz., "road saturation point." Traffic congestion, with its ensuing delays, inconveniences, and increasing number of fatal accidents, has begun to restrict the heretofore indiscriminate use of passenger automobiles. As a result there is a growing tendency on the part of automobilists again to patronize the electric railways, especially that large class of car owners whose occupations do not make it necessary for them to use the motor car in the transaction of their daily business. It takes time for the habits of the public to change, but the fact remains, however, and it is common knowledge, that a change in the riding habit is now going on. People who formerly rode the electric railway and later on forsook it are now coming back.

The effect of this change on street car traffic is more evident in the larger cities, but the movement is spreading and is also becoming noticeable in the cities with populations of 50,000 and up.

The year 1923 was the biggest the automotive industry has ever seen. Approximately 3,650,000 passenger cars were manufactured, and there were more passenger car registrations than in any previous year. Coincidentally with this record output and registration the electric railways carried more passengers in 1923 than in any other year in the history of the industry. And all this happened without any considerable track and road extension. Here is what the record of automobile registration and passengers carried by electric railways shows since 1917:

Year	Passenger Automobile Registration	Per Cent Increase Over Previous Year	Passengers Carried by Electric Railways	Per Cent Increase Over Previous Year
1917	5,101,000	....	14,506,000,000	....
1918	6,064,000	18.8	14,243,000,000	—1.1
1919	7,539,000	24.3	14,915,000,000	4.7
1920	9,118,000	20.9	15,540,000,000	4.2
1921	9,345,000	2.5	14,574,000,000	—6.2
1922	10,863,400	16.2	15,337,000,000	5.2
1923	12,880,000	18.5	15,989,000,000	4.2

Is it not remarkable that in this six-year period passengers carried by electric railways have continued to increase in the face of an increase in passenger automobile registration of approximately 7,780,000?

"What about motor buses replacing the electric railways?" is another popular question. The passenger traffic figures I have just cited is one answer. Buses never can handle the volume of traffic which the electric railways are moving daily. Another answer is that in those cities where the public has tried both systems it has decided in favor of the electric railway. Is there any reason to suppose the experience of the citizens of Des Moines, Toledo, Saginaw, Bridgeport, and other cities, is not representative of the public feeling elsewhere? Akron has more recently tried and reached the same answer.

We all know that the motor bus supplies a very definite need. Be that as it may, it cannot supplant the service rendered by the electric railways. Experience has demonstrated that the bus is of more value to the public in supplementing electric railway service than in superseding it. The public is principally interested in cheap, dependable transportation, and it is realizing more and more that this can be furnished best by the electric railway. It is also realizing more and more that the unregulated operation of buses has an unfavorable effect upon local transportation service. Consequently there is more of a tendency on the part of public authorities in most sections of the country to give the electric railway companies a chance.

An outstanding feature in this connection is the experience of the street railway in Des Moines, Iowa, where the public has identified itself with the company's future by purchasing preferred stock on the "customer-ownership" plan.

Congestion of city streets is another problem, and the regulation of traffic to relieve this congestion is helping the railways to speed up their car movements and incidentally pick up more passengers. Parking of cars along the curb on city streets will soon be a thing of the past. It cannot go on unless the streets are widened, and this in many instances is impossible, at least not without great expense to and burden on the taxpayer. Years ago when we had cobblestone gutters and plank sidewalks the farmer was accustomed, on his weekly trips to town, to hitch his horses to iron rings placed in the wooden sidewalks along the curb for that purpose. As the cities grew and the march of progress demanded better pavements and better sidewalks, so passed the hitching rings and the parking of farmers' wagons. Thus it will be with automobiles if we are to keep our city streets open for the free and easy movement of traffic.

RELATIVE VALUES OF STREET OCCUPANCY

Much has been said about the ability of automobiles and motor buses properly to handle passenger traffic. Not yet, however, have I seen any practical demonstration or figures to prove these statements. In Baltimore, as perhaps some of you know, a recent count of downtown traffic conditions showed that five times as many automobiles carried less than one-fifth as many passengers as street cars; that 4,130 parked vehicles not only took up all the available space, retarding the use of other automobiles while the owners of the parked cars were transacting business, but in addition the parked automobiles lessened the width of the street about half and practically choked up all the main arteries in and out of the city.

In Grand Rapids, Mich., a recent check of the same character during the rush hour showed that in a certain period 119 street cars and 1,130 automobiles passed a given point. In other words, 9.53 per cent of the passing traffic was composed of street cars and 90.47 per cent of automobiles. The passengers carried by the street cars numbered 3,647 and the passengers carried by the automobiles 2,094, or 63½ per cent by street cars and 36½ per cent by automobiles. The space taken up in the street by the 119 cars figured 4,760 lin.ft. and by the 1,130 automobiles 15,820 ft. The street cars occupied 23 per cent of the space, the automobiles three and one-half times as much, or 77 per cent of the space. In other words, the automobiles took up three and one-half times as much space on the street and carried only a little more than one-half as many people. Figured in another way, the automobiles took seven times as much street space per passenger as did the street cars. And yet some people say that automobiles and auto buses alone without the street cars can properly take care of the traffic in large cities.

I hold no brief against the motor bus. On the contrary, I am strong for it in its proper place and have long been an advocate of its use in conjunction with the railway. Therefore, do not imagine that I am trying to prove with the few figures given that it has no place on city streets. I think it has, but not as a substitute for electric cars. The Grand Rapids figures are not by any means conclusive and the check included not only buses but all sorts and sizes of private automobiles. They are only given to show that the street car still occupies a prominent place in our daily life and is a necessity, not a luxury, nor a thing of the past.

If all of the 1,130 Grand Rapids automobiles had been full sized buses, they would have occupied 31,640 ft. of street space, and if fully loaded with sitters and standees they would have carried only approximately 45,000 people; whereas to carry the same number of passengers by the railway only 452 cars would have been required and only 18,080 ft. of street occupied.

The various factors mentioned are some of the reasons why the outlook for the industry seems more encouraging to me now than it has for several years. I do not mean to say that every individual company's troubles are over. Such is not the case, especially in those places where the local company has not received proper treatment in the matter of fares and relief from motor bus and jitney competition. Short-sightedness on the part of local authorities frequently is the reason for such conditions.

OUTLOOK FOR FUTURE GOOD

The improvement that has taken place in the industry since 1918 augurs well for the future. True, this improvement has not yet in many instances reached the point where the balance after operating expenses, taxes and a reasonable allowance for depreciation shows a fair return on the property investment. Nevertheless the net earnings trend is in the right direction, and the investing public has begun to take notice.

One year ago the average investor declined to even look at traction bonds. Now he is not only willing to look but willing to buy. His former fears about the economic usefulness of electric railway transportation are diminishing. Of course, the investor must continue to discriminate; he must pick and choose his traction bonds and securities in just the same way he picks and chooses when buying other classes of securities. This however, is not the important point I am trying to get across. What I want to get into your minds is that electric railway securities are now beginning to attract attention and many buyers, heretofore not receptive, are looking them up. Proof of this is shown by some of the electric railway financing done during the past year:

Market Street Railway of San Francisco.

United Railways & Electric Company of Baltimore.

Boston Elevated Railway.

Philadelphia Rapid Transit.

United Railways of St. Louis.

They have all been successful in selling their bonds and short-term notes on a basis of from 6.25 per cent to 7 per cent in a highly competitive market.

The success of these companies undoubtedly will encourage others to enter the market, and as the public becomes acquainted with the improved financial condition of electric railways the demand for their securities will increase. Is it logical that a railway bond issued by a road in a growing and prosperous community, one that earns more than two and one-half times its interest charges, should go begging? I say "no"; and when the investing public gets over its scare, it will not.

It may be necessary to give some companies a dose of physic. Such treatment has been administered to a few already and with good effect. I mean by this it may be necessary in some instances to make a new stack-up of the capital structure in order to save the company and its service for the people. I know whereof I speak, for frankly I have already sat in on one or two parties of this kind. Happily, the patients have lived and are now rendering good service.

I do not advocate stringent measures of this kind unless it becomes imperative to adopt them. If they are adopted it is well to keep down the bond issue; it always is a burden and sometimes a severe taskmaster. The amount of stock issued does not so much matter, for all we want and all we are entitled to is a fair return on a fair value of the property, and whether this return is divided over a larger or a smaller amount of stock makes little difference.

Right now, and to the country's detriment, the investment in tax-exempt securities amounts to more than $12,000,000,000. If Secretary Mellon's tax revision plan goes through there undoubtedly will be a large amount of capital released for investment in other classes of securities. This will be a good thing and of benefit to all.

The experienced investor who buys bonds in lots of $10,000 and over is going again to become a factor in the market. This type of buyer usually has no prejudices or sentiment about securities. Values are what interest him. He measures these values by the degree of safety and the return obtainable. Opportunities of this sort are to be found at present in bonds of those electric railway companies which during the past five years have earned their interest charges by an adequate margin. The ability to earn under the very difficult operating conditions which have prevailed is a real test of earning power, and this fact is now recognized more than at any other time in several years.

With a credit basis again established electric railway companies can more readily finance necessary extensions and improvements. This basis I think is fast becoming established. It is necessary if the companies are going to grow and prosper and properly serve the communities in which they operate. No community can grow and prosper that starves its utilities, and that is why I say in growing and prosperous communities the electric railways and other utilities will flourish and grow strong.

I have not stuck strictly to the text assigned me and I fear I have rambled far afield. But just the same it has been a privilege to be allowed to express my views on electric railways, and in conclusion I want to say that I still have faith in the future of the industry because I still have faith in the ultimate fairness of the American people and their good sense on all important matters which concern their welfare.

COMPETITION among like or substitute agencies of transportation must be eliminated. We have as a people become so accustomed to look upon competition as an automatic solvent of our economic problems that we cannot readily accept the thought that monopoly operates as a beneficent principle. . . . In fact, instead of less monopoly we should introduce more monopoly, even to the point where we get complete integration of the supply of local transportation, by whatever agency performed.—R. T. ELY.

(*See page* 312)

Association News & Discussions

Bus Operation and Accounting*

By L. J. Wertzler

Assistant Auditor of Passenger Accounts, Chicago, North Shore & Milwaukee Railroad

A REVIEW of present conditions indicates that bus service is to be a permanent part of the transportation service given by many electric railway companies, partly as a protection to their present business and partly for the purpose of securing new business. There is no apparent agency that can operate these bus lines in a more efficient and economical manner. The organization is already established, with departments in charge of executives familiar with the problems of passenger transportation. The traffic department exists for the solicitation of business, the transportation department for the operation of the buses and station facilities, the mechanical department for the maintenance of the buses, the maintenance of way department to assist if necessary in keeping the roads open in bad weather, the general offices for the accounting and administration and the storehouse for storing of repair parts. I do not mean that the various departments can shoulder this additional expense without feeling it, but obviously it can be done much more economically and efficiently by a railway than if an entirely new organization has to be established.

The same precautions must be exercised in providing clean, comfortable riding buses in charge of competent uniformed operators as in operating railway cars. Due regard must be given to schedules and station facilities to meet the requirements of patrons. Operators should be made to understand their responsibility of observing road rules, stopping at railway crossings and giving due respect to drivers of pleasure machines.

Establishment of Rates

Some of the state commissions require the filing of tariffs covering bus operation in the same manner as railroads, some require a schedule showing territory served only and in other states the commission has no authority regarding rates or schedules. It is to the advantage of the railroads for the state commission to have authority regarding the operation of buses and the filing of tariffs. The Interstate Commerce Commission apparently has no authority over the bus operations, as it does not require the filing of rates and its authority is not required for operating buses.

The North Shore Line has established some through rates covering combination of rail and bus transportation, and these rates are considerably lower than the sum of the locals. The revenue must be apportioned, however, to give the railroad the full tariff rate for its proportion of the haul. It was necessary to make these rates in order to meet competition to a certain large and well patronized summer resort. We also find it necessary in certain instances to provide transfer facilities from railroad to bus line and vice versa.

When our bus lines were first operated the rates were on the same basis per mile as on the railroad, but we soon found that this was not sufficient to meet operating costs. The rates were then revised so that the bus rates on one way and commutation tickets are 20 per cent higher than our rail rates, with the exception of our bus line between Waukegan and Kenosha, which serves the same towns and cities as the railroad, though operating 1 mile to the east. Here, the tickets permit passengers to use either bus or rail. Our minimum adult ticket and cash fare is 10 cents and passengers who fail to purchase tickets before boarding buses are required to pay the cash fare rate, which is 10 per cent greater than the ticket rate. We have ticket offices and waiting rooms at main towns and cities. Most of these are located in stores or refreshment parlors and are paid for on a commission basis.

On lines where the bus fare is higher than the rail fare a distinctive color of ticket is used for convenience of bus operators in detecting whether the passenger has paid the correct rate and is entitled to ride on the bus.

When we started operating buses the operator lifted and canceled all tickets when passengers boarded the bus, and he had no means of detecting overriding. Now, operators cancel and return the tickets to the passengers after noting the point where the passengers boarded the bus. The operator then lifts the ticket when passenger leaves the bus, and if there has been overriding, as shown by the destination on the ticket, an additional charge is made.

For cash fare collections we issue a receipt by means of the McDonald ticket box, the receipt showing whether half fare or adult fare is charged and the points between which passenger intends to ride. This receipt is surrendered by the passenger when leaving the bus and both portions are turned in to auditor for comparison.

A trip report showing date, run number, leaving time and starting point, arriving time, destination, mileage, number of tickets and cash fares for each individual trip and operator's name, together with time on duty, is turned in daily with both portions of the cash fare receipts. The cash receipts are checked to verify the rates collected and to see that all receipts are accounted for. The total of the cash fare receipts is compared with the total shown on the trip report of the operator. The ticket collections for each trip are turned in in separate envelopes properly marked. These tickets are counted and valued, and the total valuation is entered on the face of the envelope. A "recap" is made daily of all bus lines, with earnings distributed by divisions, and the cash remitted is checked against the amount due. Cash and ticket averages and shortages are also shown on the recap, the operator being charged for all cash shortages.

Accounting Practice

An individual account is kept for each operator. The bus operator in making up his trip report simultaneously by the use of carbon paper makes up a mileage stub, which is turned in to the transportation department. The accounting department makes use of the operator's recap sheet and the transportation department's daily mileage report in compiling a daily earnings statement, which shows the number of passengers carried, mileage operated, total revenue, revenue per car-mile and revenue per passenger, as compared with same information of the corresponding day of the previous year, with weather conditions also noted. A copy of this earnings statement is sent to various department heads and officials. At the end of each month a condensed statement showing total cash remitted, cash and ticket revenue and operators' unadjusted shortages is rendered the general accounting department of the controlling ledger. The total cash is balanced daily and monthly with the amount credited to bus operator's remittances by the treasurer.

The accounting for the motor bus business is carried through practically the same procedure as for the railway. In fact, the Interstate Commerce Commission's classification of accounts for electric railways was used as a basis for making the bus account classification. Only such changes were made as were necessary to adapt it to bus operation. The bus accounts classification that we use is the same as that adopted by the American Electric Railway Accountants' Association at its 1923 convention.

The investment account of the buses is kept in the railway investment account as an auxiliary investment. All other accounts are separate from the railway accounts.

An income and expense statement is compiled in the same manner as for the railway, the gross figures being included in the general income and expense statement through the auxiliary accounts. The taxes of the bus operation are chargeable to railway taxes, through the provision of the Interstate Commerce Commission classification, under the heading of "auxiliary operations."

---

*Abstract of paper presented at the meeting of the Central Electric Railway Accountants' Association, Fort Wayne, Ind., Feb. 29, 1924.

A tire reserve should be provided based on mileage operated unless the operating company has a large fleet of buses so that the renewals issued from the storekeeper keeps an average charge to expense. Other reserves, such as casualty, property damage, fire insurance and depreciation, should be provided, but the basis depends upon circumstances, which must be decided by each individual company.

We render both quarterly and annual reports of income and expense to the state commissions. These reports are practically the same in form as those rendered for railway operation.

The North Shore Line is now operating twenty-eight buses and no doubt will purchase additional equipment in the near future to meet the growing demands. Some of these are parlor buses, used for long trips and special parties. They are equipped with deep-cushioned movable chairs and compare favorably with the parlor car equipment on the railroads.

We have constant demands from lodges, societies, schools, etc., for chartered buses, for which a charge is made on a mileage basis, with an additional charge for waiting time.

Our traffic department is completing arrangements for tours covering periods from four to seven days, with rates which will include hotel accommodations and side trips, such as boat excursions at the various summer resorts, etc. Arrangements have also been made for reservations for these tours through the various tour agencies throughout the country.

It has not been my intention in preparing this paper to make it appear that the bus business is all velvet. We have new problems to solve and new conditions to meet when the motor power is gasoline instead of electricity and the right-of-way is the public highway instead of a smooth roadbed and steel rails.

Western Engineers Report on Chicago Transit Problem

According to the report of the committee on local passenger transportation of the Western Society of Engineers, approved by the board of direction on Feb. 19, 1924, the particular development which seems likely to give the greatest relief is the co-ordination of the surface and elevated railways. This should be coupled with the extension of tracks and other facilities to serve the ever-growing traffic in all parts of the city. Various suggestions for the solution of Chicago's transit problem were given in the issues of ELECTRIC RAILWAY JOURNAL for Feb. 16 and 23. The report of the committee now given summarizes the conclusions reached as the result of studying the various proposals.

An important consideration is that the facilities of the transit lines should offer the least interference with other traffic and promote the comfort and convenience of the largest number. The following principles are recommended as the basis for the solution of the present problem:

1. Construct a limited system of subways and expand the existing elevated and surface railways, including bus-line feeders where desirable, to form a comprehensive and unified system of transportation.
2. Consolidate and co-ordinate all surface and elevated lines, so as to insure unified operation.
3. Establish on the unified system within the limits of the city, a single primary fare, based on cost of service, with free or paid transfer between rapid transit and surface lines, as the economics of operation determine to be necessary.
4. Limit the rate of expansion of the unified system to that which shall be reasonably justified by the demands of traffic.
5. Route through traffic so as to avoid congested centers, so far as feasible.
6. In view of the fact that financial losses, interference and other difficulties are driving private capital from the local transportation field, it is believed that unless legal and financial conditions can be changed so as to again attract private capital, the credit of the city must be used to acquire the present surface and elevated systems, as well as for the extensions required.
7. If the unified system is financed by the city, operation should be by a private corporation under lease, supervised by a board of commissioners. These commissioners should have long tenure of office and should be competent persons selected from the financial, engineering and commercial fields.

The following principles are believed to be fundamental in determining the type of construction to be used for rapid transit:

1. The wide extent of territory to be served, the low density of population and the limitations imposed by the cost render the so-called comprehensive system of subways impracticable.
2. A modern elevated type should be the standard construction for the city, owing to its lower cost. (Open-cut construction may be substituted for elevated structure where applicable.)
3. The proper function of subways in Chicago will be to accommodate elevated trains and surface cars in areas where space on or above the surface is inadequate to accommodate the needed transportation.

In order to extend the area occupied by the downtown district, the following principles are recommended:

1. Improve the conditions south of Loop district as follows: (a) Straighten the Chicago River from Polk Street to Eighteenth Street. (b) Open through north and south streets between State Street and the relocated river. (c) Rearrange the steam railroad facilities south of the Loop district to permit the opening of streets as described in (b).
2. Provide additional transportation facilities throughout an enlarged area surrounding the present loop.
3. Reduce the allowable height of buildings, in order to decrease the maximum density of occupation.

PRIVATE AUTOMOBILES, CABS AND BUSES

These facilities have their place in the development of the city and the solution of its transportation problem.

The motor buses are valuable as extensions of surface or rapid transit lines, in districts where the rate of fare is not an essential consideration and on streets where fixed tracks are objectionable.

Among the many street improvements which have been suggested to facilitate the handling of all classes of traffic, the following are recommended:

1. Open up and widen important through streets.
2. Remove the produce market from South Water Street to a less congested location.
3. Separate street and railroad grades where traffic requires.
4. Complete paving through the outskirts of the city of the arterial streets necessary to connect with state and county highways.

The following improvements in use of street space and in handling of street traffic are recommended:

1. Establish loading zones for street cars in congested districts where feasible.
2. Prohibit parking in streets and alleys of the downtown district between the hours of 7 a.m. and 6:30 p.m.
3. Limit the height of the crown of street paving in order to facilitate the full use of streets.
4. Widen pavement at loading points of buses, when possible, so as to permit free passage of other vehicles.
5. Develop and extend a co-ordinated through-street system and install adequate signs throughout.
6. Install additional automatic and uniform signal lights at congested intersections.

Among the many suggestions which have been made, the following are believed to have sufficient merit to justify a full investigation, but are not recommended without such investigation:

1. Use of steam railway right-of-way and tracks in connection with the rapid transit system.
2. Provision for additional parking space in the vicinity of the Loop district.
3. Reduction of terminal loops and switchbacks of surface line cars in the downtown district.
4. The policy of fixed instead of open bridges over the Chicago River, with provision for barge transfer and terminals.
5. Use of sidewalk subways, elevated sidewalks or arcades in the Loop.
6. Use of special assessment policy to meet cost of construction of transportation facilities in excess of that which would be supported by a reasonable rate of fare.

The News of the Industry

Loop Favored

Engineers Vote for Completion of Loop in Cincinnati—Representatives Will Visit Other Cities

Cincinnati, Ohio, is overwhelmingly in favor of the completion of the entire loop of the proposed rapid transit system in Cincinnati, even though it would involve an issue of $6,000,000 of additional bonds, according to the consensus in the first answers to the questionnaire sent out by the Engineers' Club of Cincinnati. It was explained in the questionnaire that the $6,000,000 already authorized for the project would complete it from Canal and Walnut Streets to Oakley. In their answers the engineers expressed themselves almost unqualifiedly in favor of the completion of the loop even at added cost. The votes against the further issue of bonds were registered because it was believed that the system as far as Oakley should first be tried out.

Less than ten of those who answered the questionnaire voted against the project as it has been planned. Some of the engineers qualified their answers and some failed to vote either way, saying that they did not understand the idea as at present projected. The engineers were about evenly divided in their opinions as to whether the system should be operated by the Cincinnati Street Railway or by a separate utility organization, but there was a decided majority against the bond issue of $2,500,000 for equipment for municipal operation of the lines. Although the majority of those whose answers were announced favored combined passenger and freight service over the system, there was almost an equal number of the engineers who would restrict the use of the system to the transportation of passengers only.

The questionnaire was sent to more than 1,500 of the foremost engineers of the Cincinnati district by the public relations committee of the Engineers' Club, to obtain the opinion among the engineers as to the future possibilities of the rapid transit system from an engineering point of view. Approximately 150 answers were represented in the announcement made at a meeting of the Engineers' Club, March 1, as part of the first returns.

As far as the transit situation is concerned affecting the local railways, there have been no further public moves recently with respect to either company. In order better to understand that problem, however, investigation of electric railway conditions in eight cities will be made by a special committee representing the Cincinnati, Ohio, city administration before consideration is taken up of a joint report of the Cincinnati Street Railway and the Cincinnati Traction Company, submitted to the street railroad committee of Council on Feb. 21. The report contained the terms upon which the two companies propose to adjust the traction situation in Cincinnati. The investigation trip started March 2. The committee will visit Boston, Toledo, Cleveland, Rochester, New York, Baltimore, Philadelphia, Washington and Pittsburgh. The first city to be visited is Toledo.

The City Council has appropriated $2,500 for the trip. Within three days after the return of the committee conferences will begin with the officers and attorneys of the Cincinnati Street Railway, which is to succeed the Cincinnati Traction Company as the operating company.

Bus and Home Rule Bills Introduced in New York

Minority Leader Bloch has introduced in the New York Assembly a bill adding a new article to the general city law relating to municipal bus and trackless trolley lines. The measure reflects the administration ideas and legalizes the existing bus lines in Greater New York and permits all cities to acquire, own and operate bus or trackless trolley lines.

A 5-cent fare for passengers is prescribed. Deficits are to be made up by appropriation of public moneys or by the issuance of further revenue bonds. Property may be taken over by purchase or condemnation, and the city may operate or maintain a bus or trackless trolley parallel to any other trolley line provided if such new line parallels on the same street an existing trolley for more than 5,000 ft. a certificate of convenience and necessity shall be obtained for its operation.

In short, by the terms of the measure blanket authority is conferred on the governing legislative body of all cities to go into the business of transporting passengers at 5-cent fare, the only restriction imposed being that in case of a continued deficit in operating the city may discontinue operations, but the measure would obligate the city to pay all outstanding obligations, and for any bonds of the trackless trolley or bus project that the city itself owned it would have no preference in payment over other creditors.

Mr. Bloch has also introduced in the Assembly a measure known as the city home rule transportation law, granting to cities of the state power to construct, acquire, own, operate and regulate transportation facilities, and transferring certain powers, duties and jurisdiction of the public service commission and of the transit commission. This measure is virtually the Walker-Donohue bill of last year adapted to the home rule amendment to the Constitution approved by the people in November.

Co-operation Established

Oakland Apparently Realizes More Will Be Gained by Working Together Than Working Separately

Oakland's one-man car war has reached the armistice stage. The safety cars are still running, but threats against them have ceased. In fact, the city authorities have voted to co-operate with the Key System Transit Company in a traffic survey. This offer has been accepted by the company and it seems likely that peace will follow.

Matters came to a climax on Feb. 14 when the application of the Key company for a permit to run a bus line in East Oakland came up for a vote in the Oakland City Council. Mayor Davie and Commissioner Moorehead favored granting the operating rights to the Peerless Stage Company in order to "end this traction monopoly," but Commissioners Carter, Baccus and Colbourn would not accede to this. Instead, they offered a plan for a traffic survey which finally was accepted by the Mayor and Mr. Moorehead.

It so happened, however, that the traction company had already made plans for a similar survey. Realizing that the rapidly growing needs of the city demanded greater knowledge of conditions on its part the company had engaged the services of Richard Sachse to study the situation and report upon it. So, at a later meeting, Feb. 18, a resolution was adopted by the Council soliciting co-operation in a traffic survey with the Key company.

This resolution pointed out that two surveys, conducted independently of each other, would cause duplication of work, delay in completion and inharmonious recommendations. Six questions were then put to C. O. G. Miller, head of the Key system. The high points were:

> What is to be the general scope of the survey?
>
> Will the company agree to carry out the recommendations of Engineer Sachse, so far as practicable?
>
> Will the company give the city's experts access to its books, records and data?
>
> Will the company welcome co-operation with the city?
>
> Must all improvements await completion of the survey or will the company, from time to time, make improvements which may be recommended?

On Feb. 23 Mr. Miller answered these questions categorically. Most assuredly, he asserted, the Key company will permit its expert, Mr. Sachse, to co-operate with the city's experts in an exhaustive survey. Most assuredly the company will give access to its books. He was also willing to confer as to the scope of the survey and he also agreed to abide by the recommendations of such joint survey. In regard to the installation of improvements, Mr. Miller said he believed that improvements agreed upon should be made as rapidly as possible and need not await the completion of the entire survey.

In the meantime, the Rosalie, erstwhile municipal bus run by the city for four months as an experiment, has been returned to the manufacturer, the city auditor having refused to release funds to pay for her, due to a technicality in the law.

Civic clubs were canvassed, citizens were harangued and petitions were circulated in the interest of city bus operation, but Oaklanders refused to wax enthusiastic over the proposition.

And so the matter died.

As for the Peerless Stage Company, its application for a permit to run a bus line between Alameda and Oakland at a 5-cent fare as compared with the 6-cent fare charged by the Key company has been referred by the Alameda City Council to the State Railroad Commission. It is now trying to induce that body to grant this permission. Decision has been reserved.

Application Made for Right to Build Philadelphia Subways

The city of Philadelphia on Feb. 29 took the first actual step toward construction of the Broad Street and Chestnut Street subway. That day application was made to the Public Service Commission for the necessary certificate of convenience to start the work outlined in step No. 1 of the high-speed transit program. There were no objections to the request and it will be granted by the commission.

During the hearing before the commission, Ralph T. Senter, vice-president of the Philadelphia Rapid Transit, explained that the company favors underground passageways for pedestrians between stations in the projected Chestnut Street subway. This subway, he said, should be completed in about three years after the start of actual work.

Board of Estimate Sued in Staten Island Case

Mayor Hylan, Comptroller Craig, Murray Hulbert, President of the Board of Aldermen, and the five Borough Presidents, all members of the Board of Estimate, were made defendants in a suit for $75,000 brought in the Richmond County Supreme Court recently by Mrs. Eva Chrampanis of Graniteville, S. I., whose husband was run over and killed by a city-owned trackless trolley car on Staten Island on March 22, 1922.

The case was opened some time ago when an attorney of St. George filed a complaint naming the city of New York as defendant. Assistant Corporation Counsel Draper claimed at that time that the city was operating the line without right and that it was not responsible for accidents. This claim of Mr. Draper came as a surprise to counsel for the complainant, and it was immediately decided to begin proceedings against the members of the Board of Estimate instead of against the city of New York.

The matter was referred to in the ELECTRIC RAILWAY JOURNAL issue of Feb. 9.

W. C. White Urges Co-operation of All Transportation Agencies

"Steam and electric railroads should be authorized by legislation to own and operate their own motor vehicles in selling transportation to the public. Through their experience in marketing transportation they are the logical operators of buses and motor trucks, supplementing their present service."

That is the keynote of an article, "The Bus and Truck in Transportation," contributed to the *Nation's Business* by Walter C. White, president of the White company.

Mr. White says that it seems to him there must be something wrong in the mental attitude of a trained transportation engineer who says he does not expect to be able to make buses pay.

Mr. White believes buses and motor trucks will play a major rôle as indispensable units in one sympathetic system embodying transportation by rail, water and motorized highways. He says co-operation and co-ordination, instead of competition, will solve problems of transportation in the relationship between buses and trucks on one hand and steam railroads and electric railways on the other.

In expressing this view in his magazine article, Mr. White quotes Elisha Lee, vice-president of the Pennsylvania Railroad System. He is also in agreement with opinions similarly expressed by Britton I. Budd, president of the American Electric Railway Association, and by such outstanding figures in the recent transportation conference as Herbert Hoover, Secretary of Commerce, and Julius Barnes, president of the United States Chamber of Commerce. Mr. White writes:

> The bus and truck would not exist today in anything like the quantity they do unless there was a public demand for them. The bus is not a competitor of the electric railway. If all the buses in operation today were removed it would make very little difference in the number of people carried by the electric railway. The touring car—individual transportation which everybody likes—is the active competitor of the railways. There are several instances of high-class bus service that pay well without showing any influence on street car revenues. The right kind of service is getting people to ride in buses instead of in their own automobiles, and those same people would drive their own cars rather than take the street car.
>
> It is important that our steam and electric railroads should enter the field of motor transportation now, and direct its development in order the better to offer the kind of service the public demands and is willing to pay for.

Mr. White emphasizes the belief of the motor industry that the same principles should govern the operation of motor vehicles as common carriers as are applied by state regulatory commissions in the operation of other public utilities. He says:

> For example, the motor bus carrying passengers for hire is, in its very nature, a monopoly, and as such should not be permitted to operate until it has applied for and secured a certificate of public convenience and necessity from a fair state commission. It should be required to carry public liability insurance adequate to indemnify injury to persons and property.

Tax questions affecting the bus and truck in a co-operative and coordinated system of transportation are treated from the standpoint of solution in Mr. White's article. On this point Mr. White writes:

> The motor industry has taken a definite stand on taxation. It contends that the cost of construction of improved highways for the use of the general public should be paid for out of funds raised by general taxation and that the entire annual budget for the maintenance of improved highways used by motor vehicles should be paid out of special taxes levied on the motor vehicle.

Films of the Industry for the Smithsonian Institution

Watterson R. Rothacker is preparing to present to the Smithsonian Institution for preservation to posterity a motion picture with scenes taken from the various movies which that film company has made in the past dealing with different phases of public utilities. Railroads and electrical companies will be represented and power plant scenes will show the source of electrical energy in 1924. The electrical industry as a whole will be featured, even beyond its application to public utilities. The methods of financing utilities will be touched upon, showing banking methods as practiced in the present year. The Rothacker Film Company says that these scenes will be selected with a view to giving people æons from now a comprehensive picture of utility enterprises in Anno Domini, 1924.

Improvements in Schenectady Deferred Until June

With no objection on the part of those appearing at the hearing, the Public Service Commission under an order issued Feb. 25 extended to June 1 next the time in which the Schenectady Railway, Schenectady, N. Y., is to comply with an order of the commission on April 4, 1923, to make certain changes in its plant and equipment to improve the service.

Franchise Conferences Proposed at Birmingham

Conferences between members of the City Commission at Birmingham, Ala., and Lee C. Bradley and J. S. Pevear, co-receivers of the Birmingham Railway, Light & Power Company, are to be held soon to discuss extensions of certain franchises of the company for a period of thirty years. It is stated that there are many franchises which will expire in six to seven years, which the receivers desire shall be extended. Members of the City Commission are understood to have agreed tentatively upon the conditions to be asked for the extensions.

Consent of the city to the separation of the Tidewater line into two sections with the elimination of quite a lot of track, including a number of railroad crossings, has been withheld by the commission. In the event that the purchasers of the Birmingham Railway, Light & Power properties at foreclosure on March 24 will not take the Tidewater line in its present condition, it is stated that it probably will be allowed to remain in the hands of a receiver unless some other buyer is found. Further discussions of the Tidewater situation, however, are expected to be held shortly between the commission and the receivers before the sale day.

Terms Outlined for Proposed New Columbus Grant

Tentative terms for a blanket franchise for the Columbus Power, Railway & Light Company, Columbus, Ohio, have been presented to the Council. An unofficial summary of the terms of the new grant says that it proposes the following:

A 6-cent cash fare, with five tickets for a quarter. (The same as at present.)

An owl car fare of 10 cents. (The same as at present.)

Universal transfers with the company given the right to designate transfer points.

Not more than 1 mile of new extensions a year unless the company can obtain the capital therefore at "reasonable" rates of interest.

That the company shall not be required to pave or repave, surface or resurface, any part of any street.

Research Graduate Assistantships

The University of Illinois maintains fourteen research graduate assistantships in its Engineering Experiment Station, for each of which there is an annual stipend of $600 and freedom from all fees except matriculation and diploma fees. These are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics or applied chemistry. These appointments are for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the degree of master of science will be conferred. Half of the time is required in connection with the work of the department to which assignment is made, the remainder being available for graduate study. Research work and graduate study may be undertaken in various branches of engineering, including electric railway engineering.

Nominations to these positions will be made this year from applications received by the director of the station each year not later than April 1. Preference is given those applicants who have had some practical engineering experience following the completion of their undergraduate work.

Additional information may be obtained by addressing the director, Engineering Experiment Station, University of Illinois, Urbana, Ill.

New Information Bureau Formed in the South

The organization of the North and South Carolina Public Utility Information Bureau has been perfected with offices in Raleigh, N. C., and Columbia, S. C.

The purpose of the organization, according to the announcement, is to seek through the distribution of accurate information a clearer understanding on the part of the public of the aims and problems of the utilities in the two states. By this means it is hoped the utilities may be aided in contributing further to the industrial development and progress so essential at this time for the two Carolinas.

Many prominent men in the utility field directed the organization of this bureau and will continue their activities under S. E. Boney, selected director. The executive committee is composed of P. A. Tillery, chairman; Stuart Cooper, vice-chairman; N. A. Cocke, R. J. Hole, Raymond Hunt, F. H. Knox and George B. Tripp.

In announcing the organization, Mr. Tillery said that the information bureau was designed to supply the people with useful and accurate information and that it was the bureau's hope to establish a partnership of understanding with the public, just as there now existed in a large measure a partnership of investment.

Street Cars Do a Greater Business than Ever

"Are Street Cars Doomed?" was contained on a page of the program prepared by the transportation department of the Chicago Surface Lines, Chicago, Ill., for one of a series of shows which each department is giving for the entertainment and education of the other departments of the system. The item ran as follows:

"There are 2,886,121 people in Chicago and 218 991 passenger autos. In each 100 automobiles passing along Michigan Avenue are 180 passengers. If each Chicago owned automobile came into the Loop area each morning the passengers at this rate would total 394,184, while 300,000 passengers enter the Loop in two morning hours by surface and elevated cars.

"The 218,991 passenger autos would each require at least 20 ft. of space in the procession, and might run two abreast at 15 miles per hour. Allow ten streets for entrance at this rate, which is very liberal, and the procession in each street would take two and one-half hours to pass. Imagine ten streets choked by autos, two rows abreast each way for two and one-half hours, to bring in the passengers now carried by cars of the surface and elevated lines.

"Ten years ago the rides on electric cars per year per inhabitant of Chicago totaled 329, in 1923 the rides were 356. In spite of the enormous increase in private automobiles street cars do a greater business than ever."

Ordinance to Oust Railway.—The Village Council of Maumee, a suburb of Toledo, Ohio, will have before it for passage at its next meeting an ordinance to oust the Maumee Valley Railway, from the River Road between Detroit Avenue and Wayne Street in Maumee. Mayor John A. Smith and Councilmen have expressed the opinion that there is no doubt but that the measure will pass. The street from which the cars would be ousted is now being paved and the village officials want the traction company to move its tracks to the middle of the street, which would cause them to assume a big proportion of the expense of the paving. The traction company and the village have been at loggerheads, too, over a renewal of its franchise, which expired about four years ago.

Bus Bee Buzzing in New York State Capital.—J. J. Dunnigan and Joseph E. Kingsley, Democrats from the Bronx, New York City, introduced simultaneously in the Senate and the Assembly on Feb. 27 a bill empowering the city of New York to establish, own, operate and finance a bus line along the Grand Concourse in the Borough of the Bronx from 138th Street and Mott Avenue to Mosholu Parkway. The rate of fare on the line is to be 5 cents forever and the deficit of operation is to be paid for by the taxpayers. At Albany the appearance of this measure is generally looked upon as a gesture to make a newspaper story for one of the big dailies. The act may pass the Senate, but appears to have little show in the Assembly, unless the lower house should "wish it onto" the city of New York.

No Comment on Paving.—The Philadelphia Rapid Transit Company, Philadelphia, Pa., said recently that it had no comment to make with regard to an agreement reported to have been reached with the Jenkintown Borough Council regarding the paving of Old York Road between the borough lines. Under the agreement it is said that the company will pay the borough $20,000 and turn over to it property rights in block paving now between the tracks, worth about $17,000. In return the franchise under which the company operates through Jenkintown will be discontinued and the company will be relieved of its annual license payments.

Mayor Protests Viaduct Fee Proposal.—Mayor W. W. Gordon of Kansas City, Kan., recently reiterated his refusal to relinquish to the Kansas City Railways rent on the inter-city viaduct, so the L road might be rebuilt in compliance with an order of Judge Kimbrough Stone. Mayor Gordon said that if Judge Stone issues an order that the city must relinquish the rent, the city will comply with the mandate, but the city will not sign an agreement to waive the consideration permanently.

Dinners Edible and Edifying.—In order that employees may become better acquainted and learn more about the company in general, the Elmira Water, Light & Railroad Company, Elmira, N. Y., recently began a series of dinners, at which various features of the company's operations will be discussed. The first dinner was given on Feb. 26, at which sixty-seven employees representing all departments were present. At this dinner, the object of which was explained by F. H. Hill, vice-president and general manager, the gas end of the business was discussed, including the progress shown in that department in 1923 and the company's aspirations for 1924.

Backs Improvement Plan.—The Association of Commerce is strongly back of the movement to obtain additional transportation facilities in Racine from the Milwaukee Electric Railway & Light Company. Recommendations which have been made to the company include the establishment of a bus serrvice from the north end of North Main Street to the zoo grounds.

Foreign News

Tickets and Fares on London Tramways

Return tickets on the London County Council tramways of London, England, issued to central termini are to be made available for return from any terminus so long as the fare originally paid is not less than that applying to the point from which the return journey is made, according to a report by the highways committee adopted by the Council. With regard to the issue of season tickets, the committee held that objections were insuperable.

On the question of increasing the length of fare stages, it was considered impracticable to increase the length of the 1d. stage by less than one section, which would raise it from 1.2 miles to 1.8 miles. Consequential increases would have to be made in the distances corresponding to other fares. The general manager estimated the risk of loss would be about £450,000 a year, which was too great to justify any such change. In regard to a proposed re-introduction of ½d. fares, the shortest distance for these would be one section of 0.6 mile, and the approximate loss would be £500,000 a year. To recoup this and the loss on longer stages, the cars would have to carry 185,000,000 additional passengers a year, and it did not seem reasonable to anticipate the increase of 30 per cent.

Paris Street Car and Bus Fares Increased

The first and second class fares on all Paris street cars and buses, which are operated by the "Transports en Commun," have been increased according to the following schedule:

	Fare, Centimes	
	Present	Former
First Class:		
One section	45	40
Two sections	60	55
Second Class:		
One section	30	25
Two sections	45	40

Fares on the Metropolitan and Nord-Sud subway lines have undergone a like increase. Although these lines are controlled by the same operating company, there are no transfers between them. Fares are now 60 centimes for first class and 35 centimes for second class.

This change is said to place Paris street transportation among the costliest in the world. At normal rate of exchange the first class street transport fare would be say 9 cents and 12 cents, although at the present depreciated value of the franc they would be much less on a gold basis. While it is stated by the authorities that the new fares are but 75 per cent above those existing before the war, they are actually greater, since the distance covered in a zone is materially less, so that in some cases a ride which formerly cost 15 centimes now has become 55 centimes. A first class ride that formerly cost 20 centimes on the trolley and 25 centimes on the bus now costs uniformly 75 centimes if the whole distance of the route is covered. Although not all passengers cover the entire distance, it is manifest that the Paris organization intends to grade the fares more closely in accordance with the length of haul, so that the revenue per mile on the long haul is approximately the same as on the short haul.

Some dissatisfaction has been expressed by residents of Paris on account of the fare increases, which work out to be 266 per cent for the second class and 275 per cent for the first class. This has also brought out a discussion as to whether it is an economic operating plan to furnish both first and second class on public service street and subway lines.

A critic has just brought to light the fact that by the inordinate use of free passes there is lost annually to the operating companies of the street and subway lines and the boat service on the Seine something like 19,000,000 francs.

British Tramway Receipts Off

Particulars of accounts and statistics of the tramway and light railway undertakings in Great Britain for the year ended Dec. 31, 1922, for companies, and March 31, 1923, for local authorities are contained in the annual return issued by the Ministry of Transport. The publication contains, as usual, elaborate statistical details for every separate undertaking.

As shown in the return, the total route mileage open for traffic was 2,594, of which 1,788 miles were worked by local authorities and 806 miles by companies. The gross receipts were £31,264,141, as compared with £32,523,339 in 1921-22, and working expenditure was £23,831,523, against £26,835,292 in the preceding year, leaving net receipts of £7,432,618, or £1,744,571 more than for the preceding year. The number of passengers was 4,349,041,241, an increase of 92,722,549 or 2.18 per cent. The miles run amounted to 351,910,233, an increase of 19,830,368 or 5.97 per cent. Of the total mileage run, 98.92 per cent was by electric cars.

Staggered Hours Proposed for Paris

Coincident with the recent increase of fares on street cars, buses and subways the Paris municipal authorities are studying the means of serving a continually increasing traffic. The consulting committee which recently met at the Hotel de Ville has issued a communiqué to the effect that an important exchange of views has been going on between the parties interested, including the users of public transport services. The principal resolution was to the effect that it would be desirable if various lines of business would spread the hours of arrival and departure of their employees over a more extended period of time than at present. This is quite similar to the plan recently proposed in New York.

The general French point of view, however, is that public transport should be made to serve the public, not that the public should bow down to the vagaries of the companies. The word is perhaps ill advised, but France is a very democratic country. The public registered its opinion that the street cars, the auto buses and the subways should be subservient to the vagaries, at least the variation in the method of life and the conduct of business of the public. There the matter rests for the moment, but it is bound to come to the surface again at any time.

London Tubes Are Linked

The construction has just been completed of new tunnels to connect in Camden Town, North London, the lines of the Charing Cross & Hampstead Railway and the City & South London Railway. For over half a mile there are now six tube tunnels almost side by side. Sometimes, however, one is above another, and sometimes they cross (at different levels). The scheme has been arranged so as to avoid having grade crossings. This is necessary as during rush hours there may be forty trains per hour on each branch, making 160 trains per hour to be handled at the junctions in all directions. When the work is done trains will be run from either Highgate or Edgware to Charing Cross, or switched via Euston to Clapham Common and eventually on to Merton to the southwest of London.

The construction of the new tunnels at Mornington Crescent (Camden Town) has given direct employment to about 500 men. The iron segments for lining the tunnels amount to 13,000 tons, and 80,000 tons of earth have been excavated. Despite the engineering difficulties, the work has been carried out with remarkable precision; the margin of error at any time in cutting the tunnels was never more than a quarter of an inch.

Trailers to Be Abandoned in Paris

Among the measures proposed recently by the Prefect of Police in the city of Paris is the entire elimination of trail cars in the area which lies within the circle of the grand boulevards. It is admitted that trailers are necessary, or at least desirable, to handle the suburban traffic from the boulevards to the area without the fortifications. There are very few street car lines running from the city beyond the fortifications and most of the suburban lines end at the various octroi gates.

The trailers used in Paris are large and cumbersome. Considerable time is wasted when they change ends. This is an inconvenience and consumes a great deal of time in the center of the city, since few of the Paris street car lines run through across the town. There is not even a continuous belt line, and at least three changes are necessary to go out and back to the starting point.

Financial and Corporate

Acquisition of Chelsea Division Likely

Proposition Before Massachusetts Legislature to Make Boston Elevated the Only Railway in Boston

There is every prospect this year that by legislative direction the Chelsea division of the Eastern Massachusetts Street Railway will be taken by the Commonwealth of Massachusetts, for about $3,000,000, leased to the Boston Elevated Railway and merged with the Elevated system so that Revere Beach may have a single ride and single fare to all parts of the Boston Metropolitan district.

Under this plan the state will take the Chelsea division by the right of eminent domain. It will lease it to the Boston Elevated on a rental basis that shall cover the necessary bond issue, just as is done in the case of the tunnels and subways that are leased to the Elevated. An appraisal of that division by the Massachusetts Public Utilities Department places the value at $3,338,000. That is approximately the amount which will have to be paid, but as the property is not worth more than about $2,000,000 to the Elevated for operating purposes it is proposed to charge the Elevated rental on only $2,000,000 and to assess about $1,000,000 against the communities which are directly benefited. Revere and Chelsea would have to pay the principal part of it and smaller amounts would have to be paid by Malden and Everett and probably by the city of Boston. Revere and Chelsea are willing to pay.

If the Elevated indirectly pays the $2,000,000 and the communities traversed pay $1,000,000 there will still remain $338,000 to be accounted for by trustees of the Eastern Massachusetts. They suggest that the Eastern Massachusetts be permitted to retain such property as the Elevated cannot use, probably the power house with its machinery and real estate, and the car equipment in the division. The Elevated can supply power much cheaper from its own modern plant in South Boston; and it cannot use the Eastern Massachusetts cars. These, then, the Eastern Massachusetts could sell or transfer and realize at least a part of the $338,000.

If the plan is adopted the Boston Elevated will become the sole street railway in the Boston Metropolitan district.

Fewer Passengers in District of Columbia

Figures compiled by R. G. Klotz, traffic engineer of the Public Service Commission for the District of Columbia relative to street car traffic, show that in 1923 the daily average number of pay passengers carried on the combined lines of the Washington Railway & Electric Company and the Capital Traction Company was 412,141, as compared with 416,882 in 1922. The average daily total number of passengers carried in 1923, which includes free transfer patrons and those who travel on passes, was 522,000, as against 529,000 in 1922.

In 1920 the two companies carried 436,863 pay passengers a day, or 24,000 more than were carried last year. In 1920 the total daily average of all passengers was 552,242, or 30,000 more than last year.

Walter C. Allen, executive secretary to the commission, believes the reduction in volume of traffic is due to the gradual cutting down of the war-time personnel in the government departments and the constant increase in the number of automobiles.

Merger Bill Passed by New Jersey Legislature

The merger bill proposed by the Public Service Corporation of New Jersey has been passed by the Senate by a vote of seventeen to one. It now goes to the House.

In support of the bill, Senator MacKay pointed out that the consent of the Public Utility Commission was a prerequisite to the consummation of a merger.

As has been explained previously in the ELECTRIC RAILWAY JOURNAL this is permissive legislation, and recourse to the authorization may or may not be had according to how the plan develops which the company is understood to have under consideration for realigning its corporate financial structure.

Moosic-Pittston Line to Be Abandoned

The Pennsylvania Public Service Commission has approved the request of the Scranton Railway to abandon that portion of the Moosic-Pittston line extending from the Lackawanna township-Moosic boundary line on the north to the southern terminal at Broad and Main Streets, Pittston. The decree of the commission sustains in its entirety the contention of the railway that the Pittston end of the line had been run at a loss and that further loss would be occasioned by the contemplated improvement.

The commission holds that with the Lauren Line, the Delaware & Hudson and the Central Railroad of New Jersey operating between Moosic and Pittston and the Wilkes-Barre Railway operating from West Avoca "the community will be adequately served." Further anticipating the construction of a modern highway by the state along the east side of the valley from Pittston to Scranton, the commission says that the building of such a road "will no doubt suggest the establishment of bus lines."

Louisville Railway Prospects Bright

Year 1924 Expected to Show Result of Program of Efficiency and Economy Recently Carried Out

For the year ended Dec. 31, 1923, the balance available for dividends from the earnings of the Louisville Railway was $489,542. This compares with $504,979 available for the same purpose for the year 1922. So reported President J. P. Barnes of the company at the annual meeting of the stockholders on Feb. 21.

At the same time directors declared a 5 per cent dividend on the preferred stock, representing a regular dividend of 1¼ per cent, and 3¾ per cent on back dividends. Dividends are on a 5 per cent cumulative basis. This leaves 11¼ per cent accumulative since October, 1918, no dividends having been paid from that date, until 1923. No common stock dividends have been paid since July, 1918. The 5 per cent is payable on March 10.

COMPARATIVE INCOME STATEMENT OF THE LOUISVILLE RAILWAY FOR YEAR ENDED DEC. 31

	1923	1922
Operating Revenues:		
Revenue from transportation	$4,255,772	$4,358,450
Other operating revenues...	190,094	184,367
Total operating revenues.	$4,445,866	$4,542,817
Operating expenses..........	3,078,522	3,190,232
Net revenue from operations	$1,367,344	$1,352,585
Taxes....................	396,000	388,000
Operating income.........	$971,344	$964,585
Non-Operating Income:		
Louisville & Interurban Railroad Company—Net income..................	127,256	145,982
Other non-operating income	37,816	17,813
Total non-operating income	$165,072	$163,795
Gross income............	$1,136,416	$1,128,380
Deductions from Gross Income:		
Interest on bonds and notes	645,819	619,589
Miscellaneous debits.......	1,055	3,812
Total deductions........	$646,874	$623,401
Balance available for dividends on stock..............	$489,542	$504,979

The year 1923 was the first complete year's operation under the plan which provides that all earnings shall be credited to a so-called barometer fund. From the fund are to be deducted operating expenses, taxes, interest on bonds and other debts, 5 per cent for preferred stock, and as long as the present rate of fare continues, and the barometer fund stands at $200,000 or more, 6 per cent dividend on common stock. Mr. Barnes explains that these sums have been withdrawn each month during 1923, and that the barometer fund, which stood at $350,000 on Jan. 1, 1923, was as of Dec. 31, 1923, depleted to $232,681, a net reduction during the year of $117,318. Mr. Barnes says that this result from the first year's operation is neither unexpected nor alarming, as several of the programs for improved economy and efficiency of service were not completed until some time after Jan. 1, 1923.

The company was particularly hard hit during the year. On the night of Jan. 15, 1923, the brick portion of the Fourth Avenue carhouse burned, with all its contents, including twenty-four passenger cars and ten service cars.

Plans were rapidly completed for a new fireproof sprinklered carhouse, with a separate office and recreation center, and the new carhouse and office were completed in October.

On Feb. 16, 1923, the carhouse at the southeast corner of Thirteenth and Main Streets was burned. In this fire sixteen cars were damaged, six of which have been repaired and placed in service.

The loss in the two fires was $270,195, but prompt payment by the insurance companies enabled the railway to proceed at once with the work of rehabilitation without any financial embarrassment and with no difficulties other than those incident to the reconstruction of the carhouses.

To replace cars totally destroyed and to provide sufficient additional trail car equipment to meet the growing needs of traffic, an order was placed last summer for fifteen new motor cars and twenty-five trail cars of the most modern type. These cars are being purchased in part with insurance recoveries and in part from the proceeds of the sale of $230,000 ten-year equipment trust certificates, Series "B," which are dated Jan. 2, 1924.

As a further precaution against possible losses from fire, the carhouse at Twenty-ninth and Broadway, which is the largest on the property, is now being equipped with automatic sprinklers.

Mr. Barnes says that great savings—and an improvement of service—have been realized from the general use of the single-truck safety car, of which 101 are in operation on city lines. Early in the year a general rerouting and improvement of schedules became effective. Fifty-five new safety cars were purchased during the year with the proceeds from the sale of $230,000 ten-year equipment trust certificates, Series "A," dated Jan. 15, 1923, similar to Series "B" previously described.

These are merely some of the outstanding things discussed by Mr. Barnes.

New Financing Plan for Detroit Municipal

A plan to refinance the Detroit Department of Street Railways, extending the D. U. R. purchase plan over a period of twenty years, is to be drafted by Clarence E. Wilcox, newly appointed head of the D. S. R. claims division. Announcement to this effect has been made by officials of the street railway department. The plan when drafted is to be submitted to the Mayor, to the Detroit United Railway and the City Council. It is announced also that in studying the various methods of refinancing, the advice and counsel of outside financial interests will be sought.

According to Ross Schram, assistant general manager of the municipal railway, the demand for extensions and improvements to the city system and for the additional cars and equipment is so great as not to permit it to be financed from the present income from operation, amounting to about $900,000 annually.

It is further announced that a sum is available from the $5,000,000 bond issue authorized by the voters last year sufficient to provide extensions contemplated within the next few years. In addition to this fund, $3,000,000 is stated to be immediately necessary for the purchase of new rolling stock. The present demands are attributed to industrial growth of the city, particularly on the west side. All previous daily records for passengers carried were recently surpassed when more than 1,600,000, persons were handled.

The reported acquisition of new locations for carhouses is denied by the commission. Work is being rushed at the city's Highland Park car shops to complete the twenty-five new trailers under construction. Requests have also been sent to car builders to rush work on the 100 new Peter Witt type cars ordered last fall and bids are to be asked for in the near future on 100 more Peter Witt type cars.

Railway in Readjustment

New Jersey Board Approves Rearrangement of Utility Properties on Atlantic Coast

The Board of Public Utility Commissions of New Jersey has approved a plan to permit the readjustment of the properties of the Atlantic Coast Electric Railway, and subsidiaries, the Atlantic Coast Electric Light Company and the New Jersey Water & Light Company, as sought to be carried out by the Eastern New Jersey Power Company.

A realignment was sought so that all of the property devoted exclusively to railway service shall belong to the Atlantic Coast Electric Railway and the balance of the property to the Eastern New Jersey Power Company. This plan has been modified with respect to the property to be owned by the Eastern New Jersey Power Company, the revised plan providing for the continued ownership by the New Jersey Water & Light Company of all of the property devoted to water service and the ownership of all of the property devoted to electric service by the Eastern New Jersey Power Company. In addition to the direct ownership of the electric property, including the power station, etc., by the Eastern New Jersey Power Company, the plan also contemplates the ownership of all of the stock and bonds representing the property of the railway and water company.

In support of the application, two appraisals of the property were submitted on behalf of the petitioner:

	Total Property at Present Prices	
Total Cost New	Cost New Less Depreciation	Plus $400,000 Additional Cash
$6.217,425	$5.678,320	$6,078,320
$6.259,416	$5,338,592	$5,738,592

Valuations of the property were also submitted by the board's engineer on several different bases of prices. The value corresponding to that just noted, at present-day prices, is as follows:

Cost New Total Property	Cost New Less Depreciation
$5,700,000	$4,625,000

The board concluded that the value of the property properly represented by the issuance of securities is $4,412,500. This total includes the $400,000 additional cash indicated previously, which with $75,000 cash included in the appraisals, provides $175,000 in cash for working capital and $300,000 cash for construction purposes.

The petitioner requested permission to issue the following securities for the Eastern New Jersey Power Company:

$3,500,000	par value of 6 per cent bonds, due in 1949
$1,250,000	par value of 7 per cent preferred stock
6,500	shares common stock, no par value

In order to make the securities comparable with the value determined by the board, it decided to permit the following securities to be issued:

$3,250 par value of bonds (at 85) to realize not less than	$2,762,500
Par value of 7 per cent preferred stock to be issued at par	$1,250,000

This will leave a balance of the total as determined by the board to be represented by the issuance of common stock amounting to $400,000. This amount will represent the value of the no par common stock.

FIRST PRESENTATION OF NO PAR VALUE STOCK QUESTION

In its decision the board points out that this is the first time that the question of the approval or disapproval of no par common stock has been before it. The act of 1921, Chapter 284, permits corporations organized under the general corporation act to issue no par value stock. The new corporation was formed under that statute. After careful consideration of the act of 1906, the board has concluded that an electric company formed under the general corporation act, although a public utility, has the right to issue no par stock. In order to carry out the purpose of the act of 1921, however, the board feels it was necessary for it to state the value of the no-par stock.

The Atlantic Coast Electric Railway has outstanding at the present time $1,000,000, par value, of stock and certain underlying bonds and obligations which are proposed to be retired. The board has determined the value of the railway property to be $1,700,000, to which is added $25,000 to represent cash working capital, $50,000 cash for construction purposes—making a total value to represent the securities to be issued by the railway $1,775,000. Deducting $1,000,000 par value of stock now outstanding from this value leaves a balance of $775,000 to be represented by a like amount of bonds to be issued at not less than 85 per cent of par.

In accordance with the terms of the order the Atlantic Coast Electric Railway, West End & Long Branch Company, Sea Coast Traction Company, Asbury Park & Sea Girt Railroad and Sea Shore Electric Railway will all be merged.

The board has also approved the transfer of all of the preferred or common stock of the Eastern New Jersey Power Company to the Utilities Power & Light Corporation of Virginia.

A syndicate including Bonbright & Company and W. C. Langley & Company, New York, is offering $3,250,000 of the first mortgage 6 per cent bonds of the Eastern New Jersey Power Company at 95 and accrued interest to yield 6.40 per cent.

Preferred Stock of Recent Merger Offered

Pynchon & Company, New York, N. Y., are offering for subscription at $91 per share and accrued dividend to yield about 7.70 per cent 15,000 shares of the cumulative preferred stock of the North Carolina Public Service Company, Inc. It is explained that the company has been incorporated under the laws of the State of North Carolina and has acquired all of the properties, rights, franchises and other assets of the North Carolina Public Service Company. These properties include the plants, distribution systems, and business of the former Greensboro Electric Company, Greensboro Gas Company and High Point Electric Power Company, and the gas plant and distributing mains and electric railway system in High Point, as well as a lease of the Salisbury & Spencer Railway, which was formerly that of the Salisbury Light & Power Company and the Salisbury Gas & Electric Company. In addition, the new company owns 92 per cent of the entire capital stock of Salisbury & Spencer Railway, which property it operates under the lease.

The North Carolina Public Service Company, Inc., is controlled by the General Gas & Electric Corporation through ownership of the entire outstanding common capital stock, and the properties are under the management of the W. S. Barstow Management Association, Inc., New York City.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

High Mark in Employees Stock Ownership.—The Lake Superior District Power Company, Ashland, Wis., has a record of 100 per cent among its employees as stockholders in the company. It required approximately two weeks to enlist the support of every employee.

One Bidder for Pomeroy Property.—At the sale of the Ohio River Electric Railway & Power Company, Pomeroy, Ohio, by Harry Hartwell, receiver, acting under orders of the Federal Court, there was but one bidder, a representative of the protective committee acting for the bondholders. Under a requirement of the court in order to qualify as a bidder a bond of $10,000 had to be put up. This was done by none except the representative of the bondholders, and, therefore, there could be but one bid. The line was first offered from Ash Street in Middleport eastward, which consisted of the old line. On this $85,000 was bid. Then the Hobson extension was offered and $4,000 bid on that. Then the whole line was offered, and a bid of $89,000 was made on that. It was knocked down on this bid subject to the approval of the court.

Seeks Relief from Maintaining Fund.—The Key System Transit Company, successor to the San Francisco-Oakland Terminal Railways, has applied to the California Railroad Commission for a modification of the decision of the commission to relieve the petitioner from the necessity of further setting aside in cash the depreciation reserve provided for in the commission's order. The applicant states that since the making of this order the San Francisco-Oakland Terminal Railways has been reorganized and put on a firm financial basis, the reorganization plan having been formally approved by the commission, and that no further necessity exists for the requirement that the said funds should be created and maintained.

$54,000 of Bonds Authorized.—The securities division of the Wisconsin Railroad Commission has authorized the Madison Railways to issue $54,000 of first mortgage 5 per cent bonds to reimburse its treasury. These bonds are to be sold at not less than 75 per cent of par.

Net Income Increases.—The City of Detroit, Department of Street Railways, reports a total operating revenue of $1,973,453 for January of the current year. This compares with $1,712,228 in January a year ago. The revenue from transportation included in the above amounts was $1,926,419 and $1,620,210 respectively. The total operating expenses increased from $1,221,492 in January, 1923, to $1,423,186 in January of this year. The net income for the month of January, 1924, was $89,023. The similar figure a year ago was $70,558. The total number of passengers carried in January of the current year was 41,451,043. In January of last year the number was 40,167,868. These figures include both revenue and transfer passengers.

Sioux City Gold Bonds Offered. — Halsey Stuart & Company, New York, are offering $2,550,000 of the Sioux City Gas & Electric Company's first mortgage twenty-five year 6 per cent gold bonds, known as Series B. The bonds, due Feb. 1, 1949, and non-callable for ten years, are being sold at 98 and interest, yielding about 6.15 per cent. The Sioux City Gas & Electric Company owns all the outstanding capital stock of the Sioux City Service Company, which owns and operates the electric railway and heating business in Sioux City, Ia.

First Mortgage Gold Bonds Offered.—Baker, Young & Company, Blodgett & Company and Arthur Perry & Company, Boston, Mass., are offering $1,000,000 of Dubuque Electric Company, Dubuque, Iowa, first mortgage 6 per cent gold bonds due April 1, 1942. These bonds, $3,200,000 outstanding, which includes bonds recently issued, are secured by a first mortgage on all franchises and property of the Dubuque Electric Company. The value of the property, as established by appraisals made in 1920 and subsequent expenditures, is about $6,500,000, or more than twice the par value of outstanding bonds.

Petition for Abandonment. — The Colorado Springs & Interurban Railway has asked the Colorado Utilities Commission for permission to cease operating its line from Colorado Springs to Roswell, a distance of about 3 miles. In its application the company sets forth that the branch line cost $7,900 to operate last year, whereas only $572 was received in revenue. The company recently informed the City Council that it did not desire a renewal of its city franchise.

First Dividend in Nine Years.—The directors of the Toledo, Bowling Green & Southern Traction Company, Findlay, Ohio, recently declared the first dividend on the common stock in nine years, authorizing a payment of 1¼ per cent. Edmund Kerper and H. W. Kinney were elected directors.

Deficit After Dividends in Providence.—The report of the United Electric Railways, Providence, R. I., for the year ended Dec. 31, 1923, shows a deficit after dividends of $275,768, compared with a surplus of $40,717 for 1922. The deficit for 1923 before payment of $206,267 in dividends early in the year was $69,501, against net income of $370,691 in 1922. Operating revenues dropped $234,109 last year and operating expenses increased $176,250.

Operations Discontinued.—The Pennsylvania & Ohio Traction Company, which for twenty-three years has operated an interurban line between Conneaut and Jefferson through Ashtabula, ceased operations on Feb. 29. Permission to discontinue service was granted by the Ohio Public Utilities Commission following a recent hearing. In its decision the commission found that for the last five years the Pennsylvania & Ohio Traction Company line had a loss of more than $100 a day.

Balance Shows Falling Off.—For the month of January the gross earnings of the Virginia Railway & Power Company were $925,885, against $909,439 for the same month a year ago. The operating expenses, maintenance, taxes and rentals were $578,605, compared with $550,912 for January a year ago. The net earnings showed a falling off of $11,247, being $347,280 in January, 1924. The balance after the consideration of depreciation and renewal reserve was $120,884, a decrease of $28,794 over the same month in 1923. The total assets of the company on Jan. 31, 1924, according to its financial exhibit, were $51,862,132.

Collateral Issue Offered.—A syndicate headed by J. A. Sisto & Company, New York, is offering at 96½ and interest to yield more than 6.80 per cent $8,000,000 of the Montreal Tramways & Power Company five-year 6 per cent collateral trust bonds. The bonds are dated March 1, 1924, and are due March 1, 1929. Under the terms of the contract between the Montreal Tramways and the city of Montreal the Montreal Tramways Commission is obliged to adjust the fares to provide the Montreal Tramways with sufficient revenue to pay all operating expenses and maintenance renewal fund payments, and an annual return to the company of at least 6 per cent on the capital value of the company's property, and on such additional capital expenditure as may be made from time to time. The amount of revenue thus provided under the contract is more than sufficient to pay the 5 per cent interest on Montreal Tramways 5 per cent debentures and 10 per cent dividends on Montreal Tramways stock, which are hypothecated as collateral for the above Montreal Tramways & Power Company's five year 6 per cent bonds. The Tramway & Power Company owns a majority of the tramway common stock.

Traffic and Transportation

Philadelphia Fare Upheld

Superior Court of Pennsylvania Decided Against City—Also Upholds $200,000,000-Plus Valuation

The 7-cent cash fare, with four tickets for a quarter, now being charged by the Philadelphia Rapid Transit Company was upheld on Feb. 29 by the Superior Court of Pennsylvania in a decision dismissing an appeal brought by the city against the order of the Public Service Commission authorizing the company to maintain the rates mentioned. In the same decision the court supported the Public Service Commission's finding that the valuation of the Philadelphia Rapid Transit property is $200,000,000 and upward. In upholding the validity of the present rate of fare, Judge Linn of the Superior Court held that the Public Service Commission has a right to fix rates irrespective of any ordinance of Council or any prior agreement.

The court said that the appeal really brought up only one contention, namely, that the rate charged is unreasonable in the sense that it yields a larger net return than appellants thought should be earned on the fair value of the property devoted to the public service. The court said in part:

> The company is entitled to receive a reasonable return for the services it furnishes and no more; the public is entitled to receive an adequate return for the reasonable rate it pays and no more.
>
> 1. It is said the commission made no definite valuation. The law does not require one. It may be made when necessary or desirable; if, in the course of its inquiry, the commission finds, as it did in this case, that it has sufficient evidence to act finally, nothing can be gained by thereafter wasting time and money in unnecessary investigation.
>
> 2. The report is condemned as vague and evasive. We are not impressed with that comment. The report contains thirty-five printed pages sufficiently stating the views of the commissioners for the purposes of the order made; we have no difficulty in determining that the order is supported by evidence; the concessions of counsel show the same thing.
>
> 3. Appellants contend the commission "gave undue weight to the evidence of present reproduction costs. It has confused the terms present fair value with present reproduction cost." A proper reading of the report shows that criticism is without foundation.
>
> 4. Objections are made to the force attributed to certain items of valuation; we consider them without merit on this appeal, and shall refer to only one, to the expenditure of $14,000,000 for street paving prior to the agreement of 1907. Of this, the commission said the city, in its historical studies, determined to its own satisfaction that the actual cost of this paving so laid was in excess of $14,000,000. The company claimed for the item of paving nearly $26,000,000. . . . In such cases we feel that all the company can claim to have protected is its original investment or price paid for the franchise, and we, therefore, can give no consideration to the higher figures which it is admitted the present cost of paving would reach. Appellants have no cause to complain of that; it is not unlawful to capitalize the amount paid for franchises.
>
> 5. The contract of 1907 between the city and the transit company provided: ". . . the present rates of fare may be changed from time to time, but only with the consent of the parties hereto." The city's brief now objects that "the commission entirely ignores the city's claim of the binding effect of the agreement of 1907, notwithstanding the fact that question, under the contract clause of the Constitution, was raised. . ."
>
> We have not found where that point was raised below. On the contrary, the commission's power to make the change was expressly conceded by the city in the complaint by which this suit was begun. In its complaint the city averred: "On July 1, 1907, the company entered into a contract with your complainant, which provided, *inter alia*, that the transit company should make no change in the rates of fare which were then in force without the consent of the Councils. Your complainant avers that while your honorable commission has power to order a change in said rates irrespective of the consent of the Councils, the said transit company has no power of its own motion to make such change without the consent of the Councils, prior to the determination and specific order of your honorable commission, without violating its obligation under said contract (of 1907) . . ."
>
> We find nothing withdrawing that; nor is there anything in the commission's report indicating any question about its power; moreover, we think the position stated in the averment was right—that the commission has the power pleaded. Without now determining that by the specific terms of its complaint and its suit before the commission the city in fact, within the meaning of the contract, consented to the change in fares ordered on its complaint, and adopted by the company, we are clear that the principles governing Leiper vs. R. R., 262 Pa. 328; Scranton vs. P. S. C., 268 Pa. 192, and White Haven Bor. vs. P. S. C., 80 Pa. Superior Court 536, and similar familiar cases, apply in this case, and that the city has not been deprived of any right under the contract.

Improved Service Promised in Springfield, Mass.

Clark V. Wood, president of the Springfield Street Railway, Springfield, Mass., has sent to Mayor E. F. Leonard a statement of the company's plans to increase service after May 1, when the jitneys, according to orders, cease service.

Mr. Wood estimates that the jitneys carry 10,000 passengers daily, of whom 33 per cent are transported in the morning rush hour, 20 per cent in the afternoon rush and 47 per cent at other times. Respecting non-rush hour traffic no additional facilities are required, he says, as cars are not now filled to their seating capacity. Nevertheless, he states that the company will provide more frequent cars on its Forest Park, Dickinson Street, State Street, Wilbraham Road and Liberty Street lines throughout the day. He also states that orders have been placed for five additional buses to be delivered before May 1. Two new bus routes are tentatively planned, and extension of the present Orange Street bus route is considered. The company's buses are operated to serve districts off the railway routes, and it is not proposed to parallel any of these routes with buses. In his statement Mr. Wood says that the company's buses are earning less than one-half the cost of their operation.

After President Wood's letter to the Mayor was published Richard J. Talbot, attorney for the Springfield Bus Owners' Association, gave out a statement saying that the proposals were "wholly inadequate to meet the traffic needs of the community."

Attorney Talbot said that a bill had been drawn and sent to Boston, to be introduced in the Legislature, ordering a stay of the Mayor's order to stop the independent bus service, until after a referendum vote could be had from the people of Springfield.

Broad Jersey Bus Plan

President McCarter Says Bus Service Will Not Be Diminished—Five-Cent Fare to Continue

Thomas N. McCarter, president of the Public Service Railway, Newark, N. J., says that if the company should acquire control of the motorized transportation system in Newark the 5-cent fare will be maintained on trolleys and buses so long as it is economically possible and there will be no curtailment of buses or bus lines. Moreover, rush-hour express service will be introduced under the proposed co-ordinated system. He also says that directors have authorized the purchase of 100 modern buses, and that negotiations have been completed for the purchase of a $300,000 plant to be used for the repairing of buses and possibly later for the building of buses.

The plans for a coordinated trolley-bus system for Newark, of which the foregoing is merely an outline, were announced on March 4 by the Public Service Railway in a letter to Commissioner Thomas L. Raymond, director of the Department of Streets and Public Improvements. The letter was signed by Mr. McCarter, and was in response to a request from Director Raymond for a statement of the company's plans.

Mr. McCarter says the plan contemplates the employment of buses and street cars in a properly co-ordinated or unified service, under a single management, so as to utilize both types of vehicles in the most efficient manner to meet in full the reasonable demands of the riding public. He is hopeful of receiving the co-operation of the people and is "confident that the consummation of such plans will redound to the public's benefit and to that of the company as well." He says that the progress of the railway during the last two months has been so encouraging that at the close of the so-called experimental period the company management made known to the Board of Public Utility Commissioners its determination voluntarily to continue the 5-cent fare now in effect. The company proposes to maintain the 5-cent fare permanently if it be economically possible.

If the law permitted, Mr. MacCarter explains, the railway would today be operating buses in a co-ordinated service with its electric cars instead of being obliged to conduct the bus end of the business through a separate corporate organization. In the development and operation of the co-ordinated bus and trolley service, there will be no diminution of service and no reduction of bus-miles operated on the Newark lines. Co-ordinated bus and trolley operation will also make possible express service where desirable during the morning and evening rush hours.

Mr. McCarter said that for weeks past he had devoted a large part of his time to the study of bus operation in other cities.

Five-Cent Fare Spells Ruin

Vice-President Hanna of Capital Traction, So Testifies—Opposed to Abolishing Commission

The establishment of the 5-cent cash, and six for a quarter rate on the lines of the Capital Traction Company, Washington, D. C., would mean ruin for the company. This statement was recently made by John H. Hanna, vice-president and general manager, before the sub-committee of the committee on the District of Columbia of the Senate, which is holding hearings on Senator McKellar's bill to abolish the District Public Utilities Commission and thereby restore the old rate of 5 cents cash, with tickets six for a quarter. The statement was made on Feb. 29 and was preceded by brief remarks by President George Hamilton, and will be followed in subsequent hearings by more detailed presentation of facts by Mr. Hanna. Mr. Hanna was the first witness on behalf of either local electric railway.

He said that in 1923 the Capital Traction Company earned a reasonable but not excessive return on the present value of its property as determined by the commission. Further that he had no reason to believe that during 1924 any higher return than this would be earned under the present rate of fare, and assuming that car riding continues to fall off during this year as it has done for the past three years, the return would certainly be less. Operating expenses had increased 175 per cent since 1914 despite the efforts to economize wherever possible, while revenue had increased only 115 per cent and fares only 63 per cent.

It was his belief that if the 5 cent, six for a quarter fare had been in effect during 1923, the other conditions remaining the same, the revenues would have failed by nearly $300,000 to meet actual costs and taxes. No income whatever would have been available for interest or other return on investments. Mr. Hanna resented the attitude of some critics by stating forcefully that the books and records of the company were always available to those vested with proper public authority.

He said that aside from the disastrous effect which the establishment of the 5-cent cash fare would have on the two railways and the service which they furnish, the proposal in the McKellar bill to take away from the commission the right to regulate fares was a serious backward step in modern government and "makes the bill of great interest and importance to all."

One-Man Cars Being Operated.—One-man cars are now being used exclusively on the lines of the Morris County Traction Company, Morristown, N. J.

Bus Fares Increased.—The Pennsylvania-Ohio Traction Company, Youngstown, Ohio, has announced an increased fare on its bus lines. The fare from Youngstown to Warren, which was 45 cents, has been raised to 50 cents, while the fare from Youngstown to Niles, which was 30 cents, was increased to 40 cents. The Youngstown-Girard fare, formerly 20 cents, was boosted to 25 cents.

Ten-Cent Fare Adopted.—The Fitchburg-Leominster Street Railway, operating lines in central Massachusetts, has adopted a flat 10-cent rate on all lines. The six-ride ticket for 30 cents will be discontinued.

Five Cents for Short Rides.—The new Gardner & Templeton Street Railway, operating between Gardner and Templeton, Mass., has instituted a 5-cent fare rate for short rides as a means of meeting competition by the buses. As a result of the departure, receipts are said to have been increased from 15 to 25 per cent.

Parking Ordinance Introduced.—An ordinance to abolish parking on several important downtown thoroughfares of St. Louis was recently introduced by Director of Streets and Sewers Clinton H. Fisk. The measure was given to the Board of Aldermen on Feb. 15. Because automobiles have been parked along the sides of narrow streets it has been impossible for more than one line of traffic to move in the same direction at the same time. Electric railway transportation has been retarded and thousands of persons have been inconvenienced.

Award Made to Distinguished Service Members.—Fourteen employees of the Birmingham Railway, Light & Power Company, Birmingham, Ala., are gold button men, who had highly satisfactory records for 1922 and 1923, for which they received the gold buttons. Another group of seventy-five men received bronze distinguished buttons for the first six months of 1923 and made a satisfactory record for the second six months of 1923, and are now entitled to receive the silver distinguished service buttons. Still another group in the distinguished service class for 1923 made a satisfactory service record for the last six months of 1923 and have been awarded the bronze distinguished service buttons.

Hours for Use of Tickets Stipulated.—A new regulation governing the sale and use of individual school commutation tickets on the lines of the Chautauqua Traction Company and the Jamestown, Westfield & Northwestern Traction Company, both in Jamestown, N. Y., provides that they will be honored for transportation between the hours of 7:30 a.m. and 5 p.m. only, effective March 21. At present there are no limits as to hours.

Extension of Time Allowed on Fare Changes. — The California Railroad Commission has granted an extension of time until April 4, 1924, to the Key System Transit Company in which to eliminate the discrimination in the matter of interurban fares between San Francisco and the city of Piedmont, which the commission found to be discriminatory as compared with other East Bay municipalities. Reference was made to the matter in the ELECTRIC RAILWAY JOURNAL, issue of Feb. 16.

Wants Operations Limited.—The Salt Lake & Utah Railroad has applied to the Public Utilities Commission of Utah for a modification of the franchise granted to the Butters & Speers Company to limit their operations to a freight line between Magna and Garfield, Utah. At present the company has a franchise to operate between Salt Lake City and Garfield. Besides denying the public convenience or necessity for a service other than that given by the railroad between Salt Lake City and Magna, the railroad alleges that the recently formed company is violating the minimum schedule on individual shipments and also that it is charging rates other than those on file with the commission.

Railway Men Invited to Criticise Traffic Plan.—C. E. Smith, consulting engineer for the city of St. Louis, has invited Col. A. T. Perkins, general manager for the United Railways, St. Louis, members of the City Plan Commission, the Board of Public Service and others interested in traffic to express themselves concerning the plan he has advanced for solving some of the city's traffic problems. Mr. Smith's plan includes the development of two new east and west traffic ways, with separated roadways at busy crossings of other streets just north and south of the present congested east and west streets. The plan consists of widening and connecting present streets, the improvements on the greater portions of which, in Mr. Smith's opinion, are backward by reason of having been partly deserted by former users and not yet fully developed for new use.

Cars Operating Over New Viaduct.—The new steel and concrete viaduct spanning the railroad tracks and Cherry Creek on Sixteenth Street, Denver, Col., has been completed. The Denver Tramway is now operating about a dozen routes over the viaduct. Since the old wooden structure was torn out, the trams have been forced to use the tracks at the street level and to cross about fifteen railroad tracks.

Classed with Motor Trucks. — The attorney-general's department in Wisconsin recently handed down an opinion ruling that passenger-carrying buses be placed in the class of motor trucks, and are therefore included in the provision fixing the speed limit at 20 m.p.h. on highways for heavy vehicles, under the state motor vehicle act. Buses are now being operated in Wisconsin under the state jitney law and the average speed is usually around 30 m.p.h. The opinion is the outgrowth of complaints about speeding received from bus patrons.

Advertising Brings Results.—During the past few years the United Railways has advertised extensively the Missouri Botanical Gardens, located in St. Louis, by means of signs on its cars, telling the patrons how to reach the gardens and also calling attention to the special showing of plants, etc. This campaign has undoubtedly helped to increase the popularity of the gardens, which is reflected in the attendance, now three times as large as a decade ago. Only 15 per cent of the many thousands of people who visit the gardens every year come in automobiles, according to statistics compiled by the officials of the garden. This fact was brought out in the thirty-fifth annual report for the gardens, recently made public by George T. Moore, director, and was given as one of the principal reasons why the gardens should not be moved outside the city limits. Such a move had been contemplated because of the need for more room for expansion.

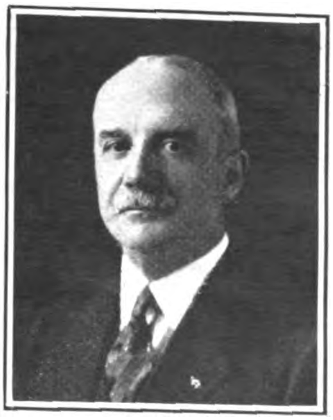
Personal Items

Messrs. Miller and Alberger Elected

Well Known Pacific Coast Executives Head Successor to Reorganized Oakland-Terminal Railways

The Railroad Commission of California recently authorized the reorganization and refinancing of the San Francisco-Oakland Terminal Railways, and the reorganization has now been effected, but the executive personnel of the corporation remains unchanged.

C. O. G. Miller is president of the successor company, as he has been since 1917 of the San Francisco-Oakland Terminal Railways and W. R. Alberger is vice-president and general manager, positions he has filled with the former company since becoming connected with the concern in 1911.



W. R. Alberger

The bondholders at a meeting in December unanimously voted to keep these two officials in their places.

Christian Otto Gorbording Miller is one of the ablest and best known financiers on the Pacific Coast. He was born in Oakland in 1865 and was educated in the Oakland public schools. As a young man, with scarcely any capital, he successfully floated a bond issue of a gas company in Los Angeles. That was thirty years ago. It marked his entrance into the utility field, in which his interest has gradually been extended since that time. Today he is president of the Pacific Lighting Corporation, the holding company for the gas concern, and a director in the Los Angeles Gas & Electric Corporation, which he helped finance.

Mr. Miller is an outstanding figure in San Francisco's world of finance. He is a director in at least twelve concerns and is vice-president of the Mercantile Trust Company and vice-president of the Realty Syndicate of Oakland.

When the affairs of the San Francisco-Oakland Terminal Railways reached a crisis on July 27, 1917, following the resignation of President G. K. Weeks, Mr. Miller was chosen president, a position which he has since continued to fill. During the war he served as the head of the San Francisco branch of the War Trade Board.

William Randolph Alberger is a veteran railroad executive. He started to learn the business as an office boy in 1876 in Buffalo, N. Y., in which city he was born. Mr. Alberger worked in several railroad offices in the East before he heeded the call of the big West and ultimately secured a berth with the Santa Fé Railroad, by which he was employed for many years. He passed through various clerkships, including several of the confidential variety, rising finally to the position of traffic manager in Oakland.

FOURTEEN YEARS WITH KEY SYSTEM

Mr. Alberger resigned from the Santa Fé to go with the Tonopah & Tidewater Railroad as traffic manager. There his capacity for hard work and his efficiency soon attracted attention. It was about this time, 1911, that the San Francisco-Oakland Terminal Railways, on the verge of being reorganized, was seeking experienced operating talent. Mr. Alberger was invited to become vice-president and general manager. Before this time Mr. Alberger had confined his duties strictly to steam lines, but he knew Oakland, he knew the Key System and some of its problems, from observation. So he accepted the offer and has since remained with the company. Under his management the company has grown to its present proportions. Twice the property has been reorganized financially, but the operating problems have been left to Mr. Alberger and have been successfully solved by him.

Four newly organized corporations all figure in the refinancing of the old corporation, namely:

Key System Transit Company, Key System Securities Company, Oakland & Hayward Railway and East Oakland Railway.

The first named will assume charge of all the properties formerly owned by the San Francisco-Oakland Terminal Railways, and the Securities Company will take the place in the reorganization of the Oakland Railways. The Key System Transit Company will be the name of the operating company. It will run under lease the railways properties of the East Oakland Railway and the Oakland & Hayward Railway.

Power Station Changes in Youngstown

H. W. Bromley, formerly superintendent of power of the Pennsylvania-Ohio Electric Company, with office at Youngstown, Ohio, resigned recently to devote his time to his personal interests. He had given more than ten years service to the company. Andrew Carnegie has been appointed acting superintendent of power. F. V. Canning has been appointed assistant to Mr. Carnegie and F. C. Beattie has been appointed chief engineer of the Lowellville power generating station, succeeding Mr. Canning.

W. B. Mayo Municipal Manager

Head of Local Detroit System Looking Into Future Needs of City Difficult Problems to Solve

William Benson Mayo, general manager of the Detroit Department of Street Railways, recently reiterated to a representative of the ELECTRIC RAILWAY JOURNAL his active interest in the proposal to provide rapid transit for Detroit. He has analyzed critically the provisions contained in the report of the Rapid Transit Commission, and it is his belief that careful consideration should be given the relation between the Street Railway Commission and the Rapid Transit Commission if the latter is to become a permanent feature. He also sees the need for serious consideration immediately of the plans for a metropolitan area.

W. B. Mayo

In Detroit Mr. Mayo has played an important part as a member of the Street Railway Commission in steering railway matters along successful lines. At the request of Mayor Frank E. Doremus of Detroit, Mr. Mayo took up the work of general manager last July after the death of former General Manager Joseph S. Goodwin left the active management of the system on the shoulders of Ross Schram, assistant general manager.

He assumed the duties as a citizen and offered his best efforts in helping the city to solve its transportation problems, with the single idea that what the citizens of Detroit desire most is the best street railway transportation regardless of the merits or demerits of public operation. Mr. Mayo's work for the public good also includes his services as a member of the board of arbitrators appointed under an agreement between the city of Detroit and the Detroit City Gas Company, dated Nov. 14, 1923, to determine what rate the company will be allowed to charge consumers of gas in the city.

In view of the fact that through years of unfortunate controversy the system taken over from the Detroit United Railway had stagnated to a great extent, the first task was that of building up a stable foundation for the municipal system. To this end Mr. Mayo has devoted his efforts unceasingly. Since 1913 Mr. Mayo has been chief engineer of the Ford Motor Company, Detroit, Mich., a position which he still holds.

Mr. Mayo was born in Chatham, Mass., on Jan. 7, 1866. He was educated in the public schools and under private instructors. For twenty-five years he was with the Hooven-Owens-Rentschler Company, manufacturers of steam engines, ten years as chief engineer and five years as vice-president and general manager.

The Detroit Athletic Club, the Detroit Club, and Engineers' Club of New York are numbered among the organizations to which Mr. Mayo belongs. He is also a member of the American Society of Mechanical Engineers, and a trustee of Antioch College.

Fred J. Miller was recently appointed a member of the Public Service Commission of Pennsylvania. He will conduct a survey of the electrical power service of the state. He is an engineer and a former president of the American Society of Mechanical Engineers.

Obituary

John F. Kent, president of the Cameron Electrical Manufacturing Company, Ansonia, Conn., died recently. Mr. Kent was seventy-four years old. He had been identified with the electrical manufacturing business of the Naugatuck Valley for more than fifty years.

Grenville S. MacFarland, attorney, editorial writer of the Boston *American* and general counsel for the Hearst interests in New England, died suddenly in Boston on Feb. 28. He had been in ill health for some time. He was graduated from Harvard in 1897. Mr. MacFarland participated freely as a commentator during the discussion of the trustee plan at Boston, under which the Boston Elevated Railway and the Eastern Massachusetts Street Railway are now operated, and also commented on the transit situation in New York for the Hylan-Hearst political interests.

Otto F. Koss, formerly superintendent of the transportation department of the St. Joseph Railway, Light & Power Company, St. Joseph, Mo., died recently. He retired from the railway property about two years ago.

F. B. Clements, secretary and auditor of the Mobile Light & Railroad Company, Mobile, Ala., died recently after a short illness. Early in 1919, when M. W. Glover resigned from the Mobile property to become auditor of the West Penn Railways, Mr. Clements succeeded him as secretary and auditor. Mr. Clements was connected with the Panama Railroad on the Isthmus of Panama for several years.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Westinghouse Expanding

Electric Company Plans Plant Extensions — Stock Dividend Declared — Additional Stock to Be Offered

The Westinghouse Electric & Manufacturing Company has authorized an issue of $17,955,000 common stock at $52.50 a share and a stock dividend of 10 per cent on the common. The new issue is payable April 16 to holders of record on March 17. The stock dividend is payable to holders of record May 2, and thus will be shared in by the new stock.

The directors have also declared the quarterly dividend of $1 a share on the preferred, payable April 15 to holders of record March 17, and the quarterly dividend of $1 a share on the common, both $50, par value, payable April 30 to holders of record March 17.

Figures of the company available for the ten months ended Jan. 31, 1924, indicate that the volume of business done, or sales billed, for the fiscal year will probably exceed $150,000,000. The directors are optimistic over the profits for the future. They believe that the demand for the products of the company will continue to increase and they have therefore approved plans for additional manufacturing facilities to be provided during the next two years. These plans will require not only further capital expenditures, but also additional working capital which the directors believe should be met by the sale of additional common capital stock.

The present outstanding capital stock of the company is $89,775,150. The present annual dividend requirements at the rate of 8 per cent per annum are $7,183,013. It is estimated that the net income available for dividends and other purposes for the fiscal year to end March 31, 1924, will be approximately $16 000,000. The annual dividend requirements at the present rate of 8 per cent per annum, on the amount of stock outstanding, including the amount offered for subscription and also the amount of the 10 per cent stock dividend above mentioned, will be $9,480,252.

Factory Employees Receive Unusual Recognition

A new method of giving recognition to the constructive work of factory employees has been put into effect by the General Electric Company. At the various plants of the company the managers presented certain workmen with sums of money and certificates acknowledging their contributions to the progress of the electrical industry. These awards were made by the Charles A. Coffin Foundation, which was established for the broad purpose of stimulating progress in all branches of the electrical industry.

This is said to be the first time that employees in any large industry, particularly workers in the shops, have been publicly recognized for work they have done for the industry outside their ordinary duties. Engineers and research workers have gained public distinction by their achievements, but the man in the shop, as a rule, has seldom become known to other than a few of his immediate associates.

Many Orders for Interurban Freight Cars

Orders for interurban freight cars totaling nearly $60,000 are now in process of being filled by the Inter-State Car Company, Indianapolis, Ind. The largest of these amounts to $37,000 and covers twenty-five cars ordered by the Union Traction Company of Indiana. Five 50-ft. motor car bodies are being built. Steel underframes and wooden superstructures are called for in the design. The car will have a capacity of 80,000 lb. The same railway has also ordered fifteen 40-ft. trail box cars of the same capacity. The bodies in this case also will have wooden superstructures on steel frames. Five 39-ft. stock cars are to be built with a capacity of 60,000 lb. each.

The Indianapolis & Cincinnati Traction Company has ordered five new 40-ft. box cars of 80,000 lb. capacity each. These cars will have steel underframes and steel body bolsters. Five stock cars are being completely rebuilt for the same railway. They will be equipped with steel panel center sills, with cover plate and steel end sill construction. The trucks and body bolsters will be all steel. These cars will have a capacity of 60,000 lb. each. Six stock cars are also being rebuilt for the Terre Haute, Indianapolis & Eastern Traction Company. All worn parts are to be replaced and when completed the cars will be practically new.

Metal, Coal and Material Prices

Metals—New York	March 4, 1924
Copper, electrolytic, cents per lb	13.937
Copper wire base, cents per lb	16.375
Lead, cents per lb	9.05
Zinc, cents per lb	7.05
Tin, Straits, cents per lb	55.75
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.70
Somerset mine run, Boston, net tons	2.25
Pittsburgh mine run, Pittsburgh, net tons	2.125
Franklin, Ill., screenings, Chicago, net tons	1.95
Central, Ill., screenings, Chicago, net tons	1.725
Kansas screenings, Kansas City, net tons	2.25
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft	$6.75
Weatherproof wire base, N.Y., cents per lb	18.00
Cement, Chicago net prices, without bags	$2.20
Linseed oil (5-bbl. lots), N. Y., per gal	$0.96
White lead, in oil (100-lb. keg), N.Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal	$1.03

Exhibits Planned to Show Manufacturers' Wares

To stimulate interest and pride in local industry the Ansonia National Bank, Ansonia, Conn., has inaugurated a scheme whereby the local manufacturers are taking turns exhibiting their products at the bank.

The exhibit of the Cameron Electrical Manufacturing Company included generator and railway motor commutators, starting and ignition commutators for automobiles, trucks and buses, industrial motor commutators, drop-forged commutator segments, formed mica rings and slot insulations, armature and field coils for all types of railway and industrial motors.

Rolling Stock

Birmingham Railway, Light & Power Company, Birmingham, Ala., has announced the complete specifications on its twenty new cars. The details are as follows:

Number of cars ordered	Twenty
Date order was placed	Sept. 28, 1923
Date of delivery	April 1, 1924
Builder of car body	Cincinnati Car Company
Type of car	Semi-convertible passenger
Seating capacity	Sixty-two
Weight:	
Car body	13,800 lb.
Trucks	10,000 lb.
Equipment	10,000 lb.
Total	33,800 lb.
Bolster centers, length	32 ft. 0 in.
Length over all	49 ft. 5 in.
Truck wheelbase	4 ft. 10 in.
Width over all	8 ft. 5 in.
Height, rail to trolley base	10 ft. 8 11/16 in.
Body	All steel
Interior trim	Cherry
Headlining	Agasote
Roof	Arch
Air Brakes	Westinghouse straight air
Armature bearings	Sleeve
Axles	Steel Brill
Bumpers	Hedley
Car signal system	Electric Service Supply
Car trimmings	Brass
Center and side bearings	Brill
Control	K-35
Curtain fixtures	National lock washers
Curtain material	Pantasote
Destination signs	Hunter
Door operating mechanism	National Pneumatic
Fenders	H. B.
Gears and pinions	G. E. helical
Hand brakes	Cincinnati
Heater equipment	Consolidated
Headlight	Golden Glow
Journal bearings	M. C. B.
Journal boxes	Brill
Lightning arresters	General Electric
Motors	G. E. 265
Motors	Outside hung
Paint	Flood & Conklin
Registers	International No. 5
Sanders	Ohio Brass
Sash fixtures	Dayton 183
Seats	Slats, Cincinnati Car
Seating material	Wood
Slack adjuster	American
Springs	Brill
Step treads	Feralun
Trolley catchers	Ohio Brass 13141
Trolley base	General Electric
Trolley wheels	General Electric
Trucks	Brill 76-E-1
Ventilators	Railway Utility
Wheels	26-in. chilled iron

Department of Street Railways, Detroit, Mich., will ask bids in the near future on 100 more Peter Witt type cars.

Trenton & Mercer County Traction Company, Trenton, N. J., through its subsidiary, the Central Transportation Company, has purchased seven street car type Fageol buses and three Fageol chassis.

Track and Line

Toledo, Bowling Green & Southern Traction Company, Findlay, Ohio, will replace 2 miles of track in Bowling Green this year at a cost of $60,000.

Interstate Public Service Company, Indianapolis, Ind., is completing the installation of about 3 miles of the new steel rails between Columbus and Indianapolis. It is expected that at least 10 miles of the new steel will be put in by spring. The new rails are 80 lb., while the old rails are 60 lb.

Market Street Railway, San Francisco, Cal., during the fiscal year 1922 to 1923 started replacing the rails on all four tracks on Market Street, from Sansome Street to the ferry. The Municipal Railway is paying its prorata share of the cost. The rail used was a new section weighing 121 lb. per yard, but so designed as to fit the joint plates at the 106-lb. rail.

Godbout, Que.—The St. Regis Paper Company has completed an electric railway in and about the town of Godbout which connects the mills and the water front. It will be used largely for the transportation of pulp and paper from the mills to the wharves. The rolling stock has been purchased and operation will be started in the spring. Power will be obtained from the hydro plant of the St. Regis Paper Company, at Godbout, on the Saguenay River.

Tri-City Railway, Davenport, Iowa, will replace six blocks of trolley wire on Second Street from Scott to Pershing. Construction of new cables to support the new trolley has already progressed along several blocks of the street.

Georgia Railway & Power Company, Atlanta, Ga., is extending what is known as the McKuhn Street switch on McLendon Street to Whiteford Avenue, a distance of about 1,400 ft. at a cost of approximately $18,000. Marietta Street will also be repaved. The track is being rebuilt on Piedmont Avenue and on Pulliam Avenue.

Trade Notes

W. J. Jeandron, United States agent for the "Le Carbone" carbon brushes, has been away for six weeks visiting the Le Carbone factory in France. It is understood that he is about to introduce into the United States dry cells and primary batteries of "Le Carbone" manufacture. These batteries will have the same high standard of quality and uniformity that "Le Carbone" carbon brushes enjoy.

C. L. Hancock is the Phono-Electric sales engineer of the Bridgeport Brass Company, Bridgeport, Conn. He has been with the company since 1920. After two years in high school Mr. Hancock went to work for Westinghouse, Church, Kerr & Company in 1906. The next year he joined forces with the Westinghouse Electric & Manufacturing Company on the electrification of overhead lines. In 1908 his work had been so unusual that the attention of the railroad officials was attracted to it and he was transferred to the New York, New Haven & Hartford Railroad in charge of its overhead maintenance. In 1910 he became chief clerk of the superintendent of electric traction and for ten years increased his experiense along this line.

E. G. Best has recently been made general manager of the Eureka Company, North East, Pa., which has passed into entirely new hands. During the past eighteen years Mr. Best has been connected in an engineering and consulting capacity with several of the largest steel companies in the United States and Canada. The company will continue its production of line materials, trolley wheels, controller and commutator parts and drop forgings.

Lapp Insulator Company, Inc., Le Roy, N. Y., has placed contracts and is now at work on additions to its plant which will double the capacity, giving an equivalent of twenty-two kilns. A contract for the main factory addition, 120 ft. x 500 ft., has been placed with the Austin Company, Cleveland, Ohio, and a contract for the largest size continuous kiln has been placed with Carl B. Harrop of Columbus.

Cameron Electrical Manufacturing Company, Ansonia, Conn., at a recent meeting of its board of directors elected John B. Davidson president and treasurer. Mr. Davidson has been identified with this company as its active directing head for more than twenty-five years. He succeeds as president John F. Kent, deceased.

New Advertising Literature

E. P. Seymour Rail Grinder Company, Waltham, Mass., has just issued an interesting new circular on its "Midget" rail grinding machine. A complete description of the advantages of the machine is given in brief itemized form and several photographs illustrate its general shape and type of construction.

Crouse-Hinds Company, Syracuse, N. Y., has issued Folder No. 8, on condulets for switch and plug receptacle outlets.

Quigley Furnace Specialties Company, New York, N. Y., has issued a booklet on "Ganisand" with illustrations. Information is given to show haw ganisand is used for refractory linings including its uses for baffles, patching boiler settings, making special tile, etc.

J. W. Paxson Company, Philadelphia, Pa., has published a forty-eight-page booklet on "Sand Blast Machinery." It illustrates and describes sand blast rooms, sand blast hose machines, dust collectors, etc.

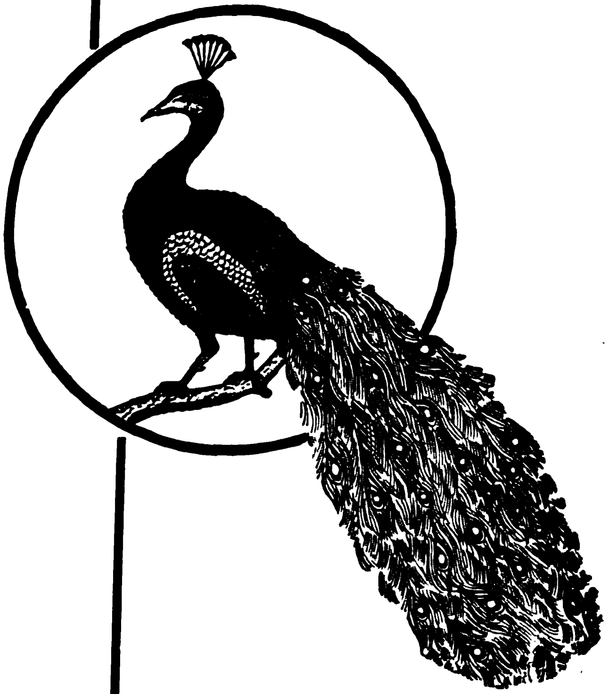
Walter A. Zelnicker Supply Company, St. Louis, Mo., has issued bulletin No. 315 on plant equipment specials.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently published an eight-page circular, known as C-1694, entitled "Supervisory Control." In this circular the general principles of operation and construction of both audible and visual systems of supervisory control for automatic substation are set forth.

PEACOCK

STAFFLESS BRAKES

In an Emergency it's the BRAKING POWER *that counts*



Stop the car before it hits. That's the emergency—and braking power is what does it.

THE Peacock Staffless Brake has three times the braking power of ordinary equipment.

On a twenty inch wheel an average man applies a braking power of 2000 lb.

Irrespective of the condition of brake rigging it will wind up tight and hold. Peacocks guarantee safety when emergency stops are necessary.

NATIONAL BRAKE COMPANY, Inc.
890 Ellicott Square
BUFFALO, N. Y.

Canadian Representative: Lyman Tube & Supply Co., Montreal, Can.

"The Peacock Staffless"

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

WALTER JACKSON
***Consultant on* Fares, Buses, Motor Trucks**
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

The J. G. White Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants. Gas Plants.
Steam and Electric Railroads. Buildings and
Industrial Plants. Transmission Systems.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation Management
52 Vanderbilt Ave., NEW YORK

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation, Studies on Financial and Physical Rehabilitation Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

J. ROWLAND BIBBINS
Engineer—921 Fifteenth St., WASHINGTON, D. C.
TRANSPORTATION
Complete Transit Surveys and Development Programs, adapting Motor-Transport, R.R. Terminal and City Plans. Traffic, Service, Routing, Operation and Valuation. EXPERIENCE IN 20 CITIES

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINCKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND NEW YORK
1570 Hanna Bldg. 84 Pine St.

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

The Most Successful Men in the Electric Railway Industry read the

ELECTRIC RAILWAY JOURNAL

Every Week

We do not know of any Heat Treatment as careful and thorough, nor any inspection as complete and rigid as we apply to all Nuttall Gearing. We do not know how to make Nuttall Gears any better.

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors SYRACUSE, N. Y.

EDWIN WORTHAM, E.E.

Consulting Engineer

Valuations of Electric Railways and Utilities of All Kinds

Traffic and Operating Studies

Allison Bldg. **Richmond, Va.**

Established Feb. 1913.

The Most Successful Men in the Electric Railway Industry read the

ELECTRIC RAILWAY JOURNAL

Every Week

C. B. BUCHANAN
President

W. H. PRICE, JR.
Sec'y-Treas.

JOHN F. LAYNG
Vice-President

BUCHANAN & LAYNG CORPORATION

Engineering and Management, Construction, Financial Reports, Traffic Surveys and Equipment Maintenance

BALTIMORE
825 Equitable Bldg.

Phone:
Hanover 2142

NEW YORK
49 Wall Street

JAMES E. ALLISON & CO.

Consulting Engineers

Specializing in Utility Rate Cases and Reports to Bankers and Investors

1017 Olive St., St. Louis, Mo.

THE P. EDWARD WISH SERVICE

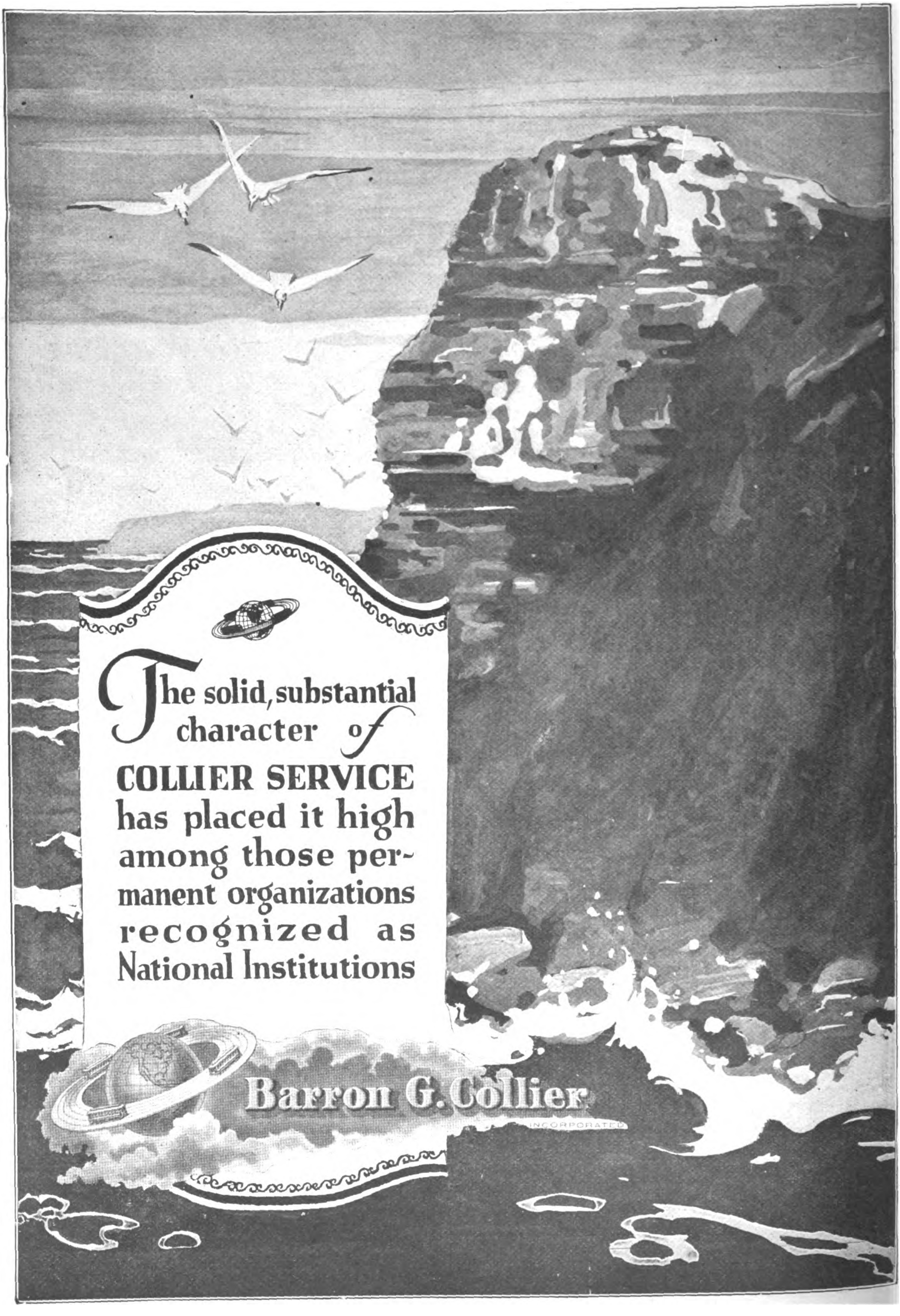
50 Church St. *Street Railway Inspection* 131 State St.
NEW YORK DETECTIVES BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal w uld be appreciated.

Byllesby
Engineering & Management
Corporation

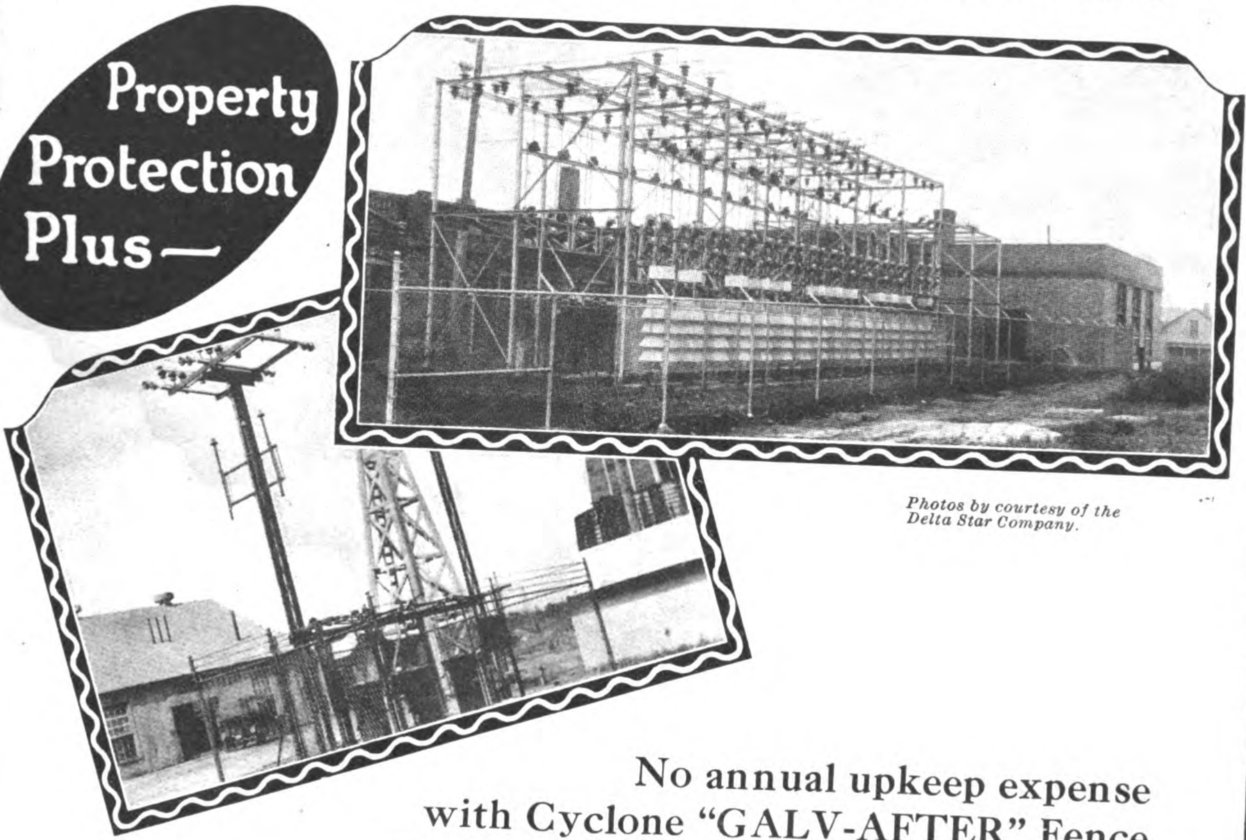
208 S. La Salle Street, Chicago

New York **Tacoma**


The solid, substantial character of
COLLIER SERVICE
has placed it high among those permanent organizations recognized as National Institutions
Barron G. Collier
INCORPORATED

The Economical Power House and Transformer Station Enclosure

Property Protection Plus—



Photos by courtesy of the Delta Star Company.

No annual upkeep expense with Cyclone "GALV-AFTER" Fence

The Cyclone Fence Company brought industrial property protection fence to its present high standards.

Now it brings to industry Property Protection Plus—"GALV-AFTER" Fence that lasts years longer than ordinary fence made of commercial "galvanized" wire; a fence that does not require annual painting and other expense. The first cost is the only cost.

Cyclone "GALV-AFTER" Chain Link Fence Fabric is Heavily Zinc-Coated (or Hot-Galvanized) by Hot-Dipping Process AFTER WEAVING. It brings new standards of fence durability and maintenance economy.

This new and better fence around your power house and transformer stations means years of economical property protection, the end of losses through trespassing, reduction of accidents to the minimum.

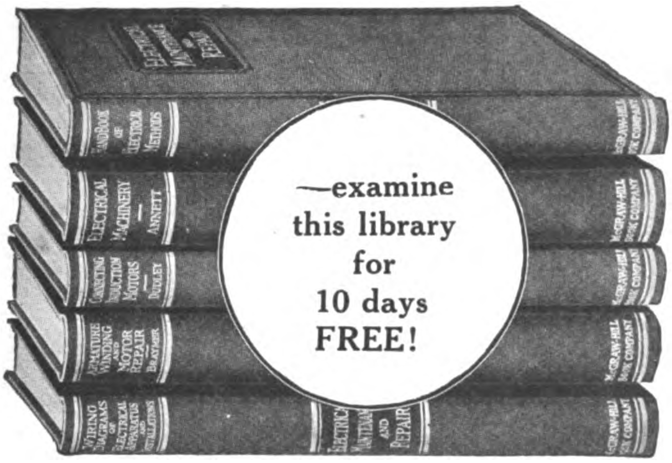
We have a special treatise on Cyclone "GALV-AFTER" Fence. You will find it of particular interest. Write for it today and for complete information about Cyclone Service, which solves any fencing problem. Address our nearest Cyclone offices, Dept. 38.

Cyclone "Red Tag" FENCE AND PRODUCTS
PROPERTY PROTECTION PAYS
CYCLONE FENCE COMPANY WAUKEGAN ILLINOIS

The Mark of Quality Fence and Service

Cyclone Fence Company
FACTORIES AND OFFICES:
Waukegan, Ill.; Cleveland, Ohio.; Newark, N. J.; Fort Worth, Texas; Oakland, Cal. (Standard Fence Co.); Portland, Ore. (Northwest Fence & Wire Works).

Cyclone Fence
PROPERTY PROTECTION PAYS



5 practical how-to-do-it books for electrical maintenance men

THIS library contains the largest collection of practical methods for electrical repair and maintenance men ever put together in book form. Here you will find the best modern practice in repair work. The authors have drawn not only from their own extensive experience, but from the experience of electrical repairmen in large and small repair shops and manufacturing plants throughout the country.

Electrical
Maintenance and Repair

5 volumes—1736 pages—1810 pictures

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong.

The books contain hundreds of photographs, diagrams and tables, which show you how to go about it to make an effective repair job. There are wiring diagrams covering A. C. and D. C. generators, feeders, transformers, potential regulators, synchronous converters, batteries and boosters, substations, lamp mechanism connections, rheostats and controllers, lightning arresters, automatic switches, railway controllers, etc.

Free examination—

No money down—only $2 a month

Fill in and mail the coupon attached and we will send you the entire set of five volumes for ten days' Free Examination. We take all the risk—pay all charges. You assume no obligation—you pay nothing unless you decide to keep the books. Then $2.00 in ten days and the balance at the rate of $2.00 a month. Send the coupon NOW and see the books for yourself.

Free Examination Coupon

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York.

Gentlemen:—Send me the Library of Electrical Maintenance and Repair, all charges prepaid for 10 days' free Examination. If satisfactory I will send $2.00 in ten days and $2.00 a month until $14.00 has been paid. If not wanted I will write for shipping instructions.

Name ....

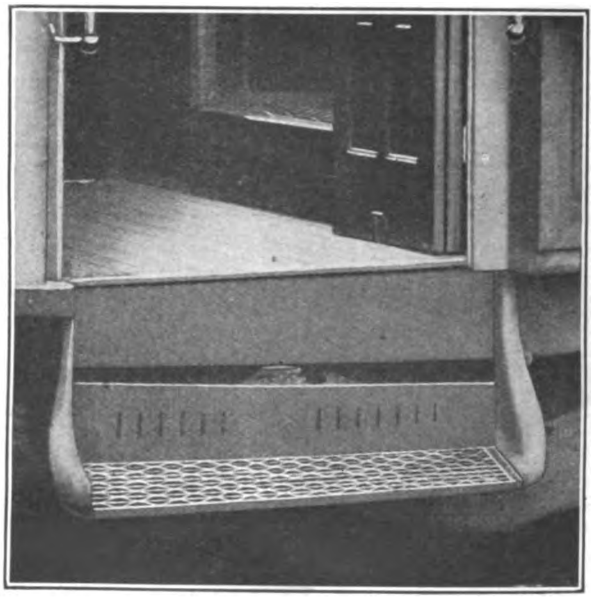
Home Address ....

City and State ....

Firm or Employer ....

Occupation ....

E R J. 3-8-24



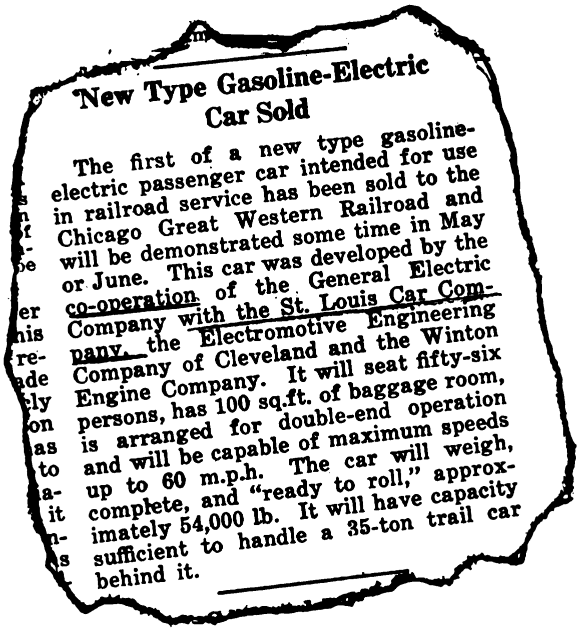
IRVING SAFSTEP TRADE MARK
(PATENTED) REG. U. S. PAT. OFF.
ABSOLUTELY NON-SLIPPING ALWAYS

One feels safe, comfortable, confident, secure—the moment one's foot rests upon this all-steel safety car step. Which means that it tends to minimize accidents and delays, and to speed up traffic. And it's more than a safe step—it is a clean, light, strong, durable step, with nothing about it to wear out or work loose. Its price is moderate—and there's no maintenance cost. There's just the size you need. See Catalog 4A-28.

IRVING IRON WORKS CO.
LONG ISLAND CITY, N.Y., U.S.A.

MANUFACTURERS OF

IRVING SUBWAY TRADE MARK
(PATENTED) REG. U.S. PAT. OFF.
THE FIREPROOF VENTILATING FLOORING



New Type Gasoline-Electric Car Sold

The first of a new type gasoline-electric passenger car intended for use in railroad service has been sold to the Chicago Great Western Railroad and will be demonstrated some time in May or June. This car was developed by the co-operation of the General Electric Company with the St. Louis Car Company, the Electromotive Engineering Company of Cleveland and the Winton Engine Company. It will seat fifty-six persons, has 100 sq.ft. of baggage room, is arranged for double-end operation and will be capable of maximum speeds up to 60 m.p.h. The car will weigh, complete, and "ready to roll," approximately 54,000 lb. It will have capacity sufficient to handle a 35-ton trail car behind it.

←"co-operation" —that's the big idea

This is just the kind of thing that tells the story of St. Louis Car Company's service to the industry!

We have the facilities and the organization to afford unusually careful attention to special jobs, and to new developments. Whether your order is for a standard safety car, or for an entirely new and unique idea in car design, it will receive the necessary consideration here to insure a "Quality" job throughout.

Let us figure on all your car requirements

"QUALITY CARS"
City Cars
Universal Safety Cars
Interurbans
Buses

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"

79.5%

DURING the past year 79.5 per cent of the readers of the ELECTRIC RAILWAY JOURNAL have renewed their subscriptions. This is the measure used by the Audit Bureau of Circulations, and required in its reports, to indicate the value of a publication to its readers. It is a measure that can be gotten only when a paper has strictly a paid circulation.

This renewal percentage of the ELECTRIC RAILWAY JOURNAL subscribers is the highest of the fourteen McGraw-Hill publications, and is probably not equalled by any other magazine.

Such evidence of the high regard with which electric railway men hold this paper is indeed an inspiration to the editors and the publisher to keep on striving to make it a product of exceptional interest and practical value.

Electric Railway Journal
(A McGraw-Hill Publication)
10th Avenue at 36th Street, New York

ELRECO TUBULAR POLES

THE "WIRE LOCK"
THE CHAMFERED JOINT

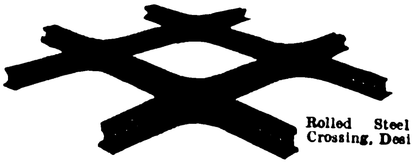
COMBINE

Lowest Cost
Least Maintenance
Lightest Weight
Greatest Adaptability

Catalog complete with engineering data sent on request

ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
NewYork City, 30 Church Street

Bethlehem Products for Electric Railways



Rolled Steel Alloy Crossing, Design 960.

Frogs, Switches, Special Trackwork, Rails, Car Wheels, Gear Blanks, Axles, Armature Shafts, Splice Bars, Bolts, Spikes, and Track Accessories.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
Sales Offices in the Following Cities:
New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Cincinnati Detroit Chicago St. Louis San Francisco

STANDARD

WIRES, CABLES AND CABLE ACCESSORIES
Manufactured by STANDARD UNDERGROUND CABLE CO.
Boston, New York, Philadelphia, Washington, Pittsburgh, Chicago, Detroit,
St. Louis, San Francisco

AETNA INSULATION LINE MATERIAL

Third Rail Insulators, Trolley Bases, Harps and Wheels, Bronze and Malleable Iron Frogs, Crossings, Section Insulators, Section Switches

Albert & J. M. Anderson Mfg. Co.
289-93 A Street Boston, Mass.
Established 1877
Branches—New York, 135 B'way
Philadelphia, 429 Real Estate Trust Bldg. Chicago, 105 So. Dearborn St.
London, 12 Moor Lane, E. C. 2

Lapp Insulators

Lapp Insulator Co. Inc. LeRoy, N.Y.

Trade Mark

Hubbard Trolley Pole Bands

Made of Open Hearth Steel.
Galvanized by the Double-Dip process.
Your best insurance for long service and durability.

Split

Solid

Ask Your Jobber
HUBBARD & COMPANY
Pittsburgh Chicago

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

AMERICAN ELECTRICAL WORKS. AMELECTRIC. Wires and Cables. PHILLIPSDALE, R.I.
Reg. U. S. Pat. Office

Incandescent Lamp Cord

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

DUNDEE "A" AND "B" FRICTION TAPES

DUNDEE
A
FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

Great Adhesive Strength
High Quality
Long Life
Price Right

DUNDEE
B
FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

Write for Samples and Circulars

THE OKONITE CO., Passaic, N. J.
Incorporated 1884

Sales Offices: New York—Atlanta—Pittsburgh—San Francisco
Agents: Central Electric Co., Chicago, Ill. Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Ltd., Montreal

OKONITE
TRADE MARK REG. U.S. PAT. OFFICE

Shaw Lightning Arresters

Standard in the Electric Industries for 35 years

Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

Chapman
Automatic Signals
Charles N. Wood Co., Boston

ANACONDA
TROLLEY WIRE

ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

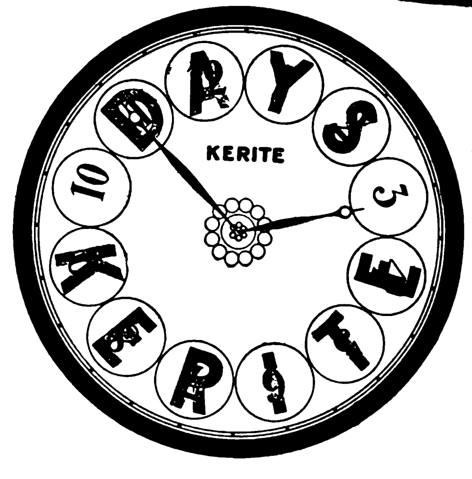
The Baker
Wood Preserving Company
CREOSOTERS
Washington Court House, Ohio

Cross Ties Bridge Timbers
Lumber Posts
Piling

Treated and Untreated

We solicit your inquiries

Creosoting Plant located
Washington Court House, Ohio
On—Penna. R.R., B. & O. R.R., D. T. & I. R.R.
Operating Mills in Southern Ohio



Time is the great test. The most efficient and permanent insulation known is

KERITE

KERITE INSULATED WIRE & CABLE COMPANY
NEW YORK CHICAGO

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

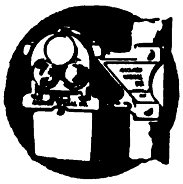
Lorain Special Trackwork
Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

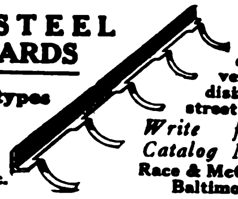
AUTOMATIC SIGNALS
Highway Crossing Bells
Headway Recorders



NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KENTUCKY.

GODWIN STEEL
PAVING GUARDS

Adapted to all types of rails and paving.



Proven by service to economically prevent seepage and disintegration of street railway paving.
Write for Illustrated Catalog No. 20.

W. S. GODWIN CO., Inc.
Race & McComas Sts.,
Baltimore, Md.

METAL SAFETY CROSS TIES
Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.
REVOLUTIONIZES ROADBEDS
Write for descriptive folder and quotation.
METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

RAMAPO AJAX CORPORATION

Ramapo Automatic Return Switch Stands for Passing Sidings

RACOR
TRADE MARK

RACOR Tee Rail Special Work.
Manganese Construction

GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

The finishing touch to a good roof—

BECKWITH-CHANDLER
Canvas Roof Paint

Compounded of highest grade materials especially for electric railways, and supplied in a full range of colors. Easily applied; has great covering power; is permanently waterproof. The ideal long life, low cost roof finish.

Full details of this and other Beckwith-Chandler products on request.

Beckwith-Chandler Company
193-211 Emmett St., Newark, N. J.
320 Fifth Ave., New York.

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

A Single Segment or a Complete Commutator

is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

Cameron Electrical Mfg. Co., Ansonia, Connecticut

RAIL BONDS
Brazed—Arc Weld
Portable Arc Welding & Bonding Outfits
THE ELECTRIC RAILWAY IMPROVEMENT CO.
Cleveland, Ohio

ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.

Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

OXYGEN
FOR CUTTING, WELDING, ETC.
INTERNATIONAL OXYGEN COMPANY
NEWARK NEW YORK PITTSBURGH TOL

The Kalamazoo Trolley Wheels

have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.

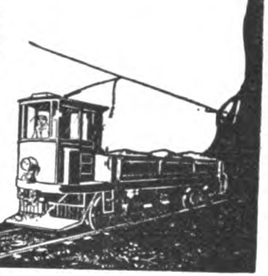
THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

OHMER FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio



The Differential Car

An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.

The Differential
Steel Car Co.
Findlay, Ohio

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED

No. 478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

193
IN
10224

Type R-10

International Registers

Made in various types and sizes to meet the requirements of service on street and city system. Complete line of registers, counters and car fittings.

Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

Fare Boxes *Change Carriers*

COIN
COUNTERS SORTERS WRAPPERS

THE CLEVELAND FARE BOX CO.
CLEVELAND, OHIO
Canadian Branch, Preston, Ontario.

BUCKEYE JACKS

high-grade R. R. Track and Car Jacks

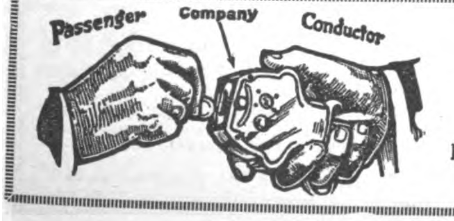
The Buckeye Jack Mfg. Co.
Alliance, Ohio

PS HEATERS

Car Heating and Ventilation

are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.



Direct Automatic Registration By the Passengers

Rooke Automatic Register Co.
Providence, R. I.

Heywood-Wakefield

CAR SEATS

of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.

HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York, Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition

USG

CARBON BRUSHES
for
INTERURBAN
or
STREET CAR
SERVICE

Every Brush Fully Guaranteed

Write today for Catalog B-3

The United States Graphite Company
Saginaw, Michigan

District Offices:
New York Pittsburgh Chicago Denver
Philadelphia St. Louis San Francisco

Griffin Wheel Company
McCormick Building
Chicago, Ill.

GRIFFIN
F. C. S.
WHEELS

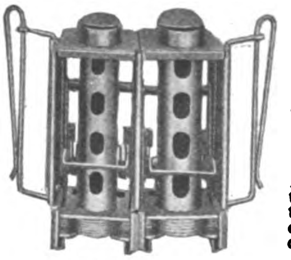
For Street and Interurban
Railways

FOUNDRIES:

Chicago	Boston	St. Paul
Detroit	Kansas City	Los Angeles
Denver	Council Bluffs	Tacoma

V-K
OILLESS TROLLEY
WHEEL and
NON ARCING HARP
"PERFECT LUBRICATION PLUS
MAXIMUM CONDUCTIVITY"
More-Jones Brass & Metal Co
ST. LOUIS MISSOURI

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

THE WORLD'S STANDARD
"IRVINGTON"

Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities

HALE-KILBURN
CAR SEATS
For Every Class of Service
General Offices and Works: Philadelphia
Offices: New York, Chicago, St. Louis, Washington, San Francisco

RAILWAY UTILITY COMPANY
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings:
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for Catalogue

1328 Broadway
New York, N. Y.

SEARCHLIGHT SECTION

POSITIONS VACANT

SUPERINTENDENT of transportation wanted; must be good executive and disciplinarian and thoroughly familiar with handling city traffic. P-655, Electric Railway Journal, 10th Ave. at 36th St., New York.

WANTED: By a large special track work manufacturer in the East, a draftsman who has thorough knowledge of mathematics, particularly trigonometry and logarithms. P-658, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

POSITIONS WANTED

AS CLAIM agent, or commerce attorney, age 38, married, Yale graduate in law, now employed, and have been for past five years, with short line, interstate road; specially qualified in Federal and State laws pertaining to railways in practice before the I. C. C. and State Commissions, as well as in the adjustment of claims. PW-661. Electric Railway Journal, 10th Ave. at 36th St., New York.

AS master mechanic or with chance for advancement; experienced low- and high-voltage d.c. equipment, passenger and freight, city and interurban; expert on motor and controller repairs. PW-656, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

AS supervisor of welding, bonding and grinding; four years' experience as travelling demonstrator of joint welding, shop welding, bonding, etc; two years' experience in all-around welding on a small road; have practical knowledge of track construction and repair; can guarantee supervision resulting in more efficiency, economy and a broader field of operation for all apparatus. Available about May 15. PW-663, Electric Railway Journal, 10th Ave. at 36th St., New York.

CORRESPONDENCE is desired with executives requiring the services of a capable man to manage the freight and passenger service of a large interurban road. PW-659, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

POSITION as master mechanic by one that has had the personal and practical experience in rebuilding and reorganizing street railway work; will give personal interview PW-662, Electric Railway Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT of transportation at present with large successful property that has been placed on sound basis largely through efforts of advertiser, solicits correspondence with managers of city, suburban and interurban properties that require a capable progressive superintendent; 19 years' experience under high-grade executives on large properties; quick to locate leaks and correct same; fully competent to take over all details and build up an organization that would be a credit to any property. Successful in dealing with public and labor in a manner that will get results; will consider any good size property that requires extra effort to get results. Best of references. Personal reasons for desiring a change. PW-664, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

Why Save It?

Equipment you have replaced, or for which you have no further use can probably be sold at a good price now. Later it may not be worth as much.

Weed out equipment and let a

"Searchlight" Ad

help you sell it promptly

G-9

Rails!

When you need new or relaying rails, come to headquarters and get just what you want, in any quantity, and get them quick.

We always have a big stock of rails, from 12 lbs. to 100 lbs. per yard, for immediate delivery. Every rail inspected and guaranteed. Complete with the necessary angle bars.

When it comes to price we are also headquarters—we have complete stocks of new and relaying rails of all weights available for prompt shipment located in thirty convenient distributing points throughout the United States, Canada and Cuba—which in turn means we can make immediate shipments at unbeatable prices to our customers. "Tons of Rails Right at Your Door." Write, 'phone or wire us your requirements.

HYMAN-MICHAELS COMPANY

"The House of Dependable Service"

122 South Michigan Avenue, Chicago

**Dealers in New and Relaying Rails,
Locomotives and Railway Equipment**

District Offices: New York, Woolworth Bldg.; St. Louis, Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.; Detroit, Book Bldg.; San Francisco, 234 Steuart St.

Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa., San Francisco. *Cable Address:* "Hymanmikel"

World's Largest Distributors of Rails

WANTED

Power Plants

We are in the market to purchase abandoned Railway and Municipal Power Plants—any size.

L. J. LAND

207 Centre Street, New York City

50 Ballast Cars

32—Side Botom Dump, self clearing, 37 cubic yards capacity, 100,000 lb. metal arch bar trucks—M.C.B. & I.C.C.

18—Same Design, rebuilt into flat bottom gondolas.

ZELNICKER IN ST. LOUIS

75-ton Baldwin Saddle Tank
40-ton Baldwin Saddle Tank
21-ton Davenport Saddle Tank
nearly New.

Locomotives, Cars, Piling, Hoists, Rail, Cable. Send for Bulletin 315.

WANTED

Single Track Right Angle Street Railway Crossing

1—Used, 4-ft. 8½-in. gauge, of 6-in. high tee or girder rail.

W-660, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

FOR SALE

10—GE-210 Motors
6—WH-514 Motors

TRANSIT EQUIPMENT COMPANY
501 Fifth Avenue, New York

FOR SALE

50—G. E. No. 80-A Motors.
50—Controllers, K-28-B; K-12.
35—B-2 Compressors.

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

FOR SALE

50—Johnson Fare Boxes type D-M-2-Two statements cash and tickets. Good operating condition.

GRAND RAPIDS RAILWAY CO.
42 Ionia Ave., Grand Rapids, Mich.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
- Collier, Inc., Barron G.

Air Receivers & Aftercoolers
- Ingersoll-Rand Co.

Anchors, Guy
- Elec. Service Supplies Co.
- Ohio Brass Co.
- Westinghouse E. & M. Co.

Armature Shop Tools
- Elec. Service Supplies Co.

Automatic Return Switch Stands
- Ramapo Ajax Corp.

Automatic Safety Switch Stands
- Ramapo Ajax Corp.

Axles
- Bemis Car Truck Co.
- Bethlehem Steel Co.
- Brill Co., The J. G.
- Carnegie Steel Co.
- Johnson & Co., J. R.
- St. Louis Car Co.
- Westinghouse E. & M. Co.

Babbitt Metal
- Ajax Metal Co.

Badges and Buttons
- Elec. Service Supplies Co.
- International Register Co., The

Bearings and Bearing Metals
- Ajax Metal Co.
- Bemis Car Truck Co.
- Brill Co., J. G., The
- General Electric Co.
- Gilbert & Sons B. F. Co., A.
- More-Jones Brass & Metal Co.
- St. Louis Car Co.
- Westinghouse E. & M. Co.

Bearings, Center and Roller Side
- Stucki Co., A.

Bells and Gongs
- Brill Co., The J. G.
- Consolidated Car Heati'g Co.
- Elec. Service Supplies Co.
- St. Louis Car Co.

Boilers
- Babcock & Wilcox Co.

Bonding Apparatus
- Amer. Steel & Wire Co.
- Elec. Ry. Improvement Co.
- Elec. Service Supplies Co.
- Ohio Brass Co.
- Railway Track-work Co.

Bonds, Rail
- Amer. Steel & Wire Co.
- Elec. Ry. Improvement Co.
- Elec. Service Supplies Co.
- General Electric Co.
- Ohio Brass Co.
- Railway Track-work Co.
- Westinghouse E. & M. Co.

Book Publishers
- McGraw-Hill Book Co., Inc.

Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
- Elec. Ry. Equipment Co.
- Elec. Service Supplies Co.
- Hubbard & Co.
- Ohio Brass Co.

Brake Adjusters
- Brill Co., The J. G.
- National Ry. Appliance Co
- Westinghouse Tr. Br. Co.

Brake Shoes
- Amer. Br. Shoe & Fdy. Co.
- Bemis Car Truck Co.
- Brill Co., The J. G.
- St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
- Allis-Chalmers Mfg. Co.
- Bemis Car Truck Co.
- Brill Co., The J. G.
- General Electric Co.
- National Brake Co.
- St. Louis Car Co.
- Safety Car Devices Co.
- Westinghouse Tr. Br. Co.

Brushes, Carbon
- General Electric Co.
- Jeandron, W. J.
- Le Carbone Co.
- U. S. Graphite Co.
- Westinghouse E. & M. Co.

Brushes, Graphite
- U. S. Graphite Co.

Brush Holders
- Anderson Mfg. Co., A. & J. M.

Brushes, Wire, Pneumatic
- Ingersoll-Rand Co.

Buses, Motor
- Brill Co., The J. G.
- St. Louis Car Co.
- White Co.

Bushings, Case Hardened and Manganese
- Bemis Car Truck Co.
- Brill Co., The J. G.
- St. Louis Car Co.

Cables. (See Wires and Cables.)

Cambric Tapes, Yellow and Black Varnish
- Irvington Varnish & Ins. Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
- Brill Co., J. G., The
- Differential Steel Car Co.
- St. Louis Car Co.

Car Lighting Fixtures
- Elec. Service Supplies Co.

Car Panel Safety Switches
- Consolidated Car Heati'g Co.
- Westinghouse E. & M. Co.

Car Steps, Safety
- Irving Iron Works

Cars, Passenger, Freight, Express, etc.
- Amer. Car Co.
- Brill Co., The J. G.
- Kuhlman Car Co., G. C.
- McGuire-Cummings Mfg. Co.
- National Ry. Appliance Co.
- St. Louis Car Co.
- Wason Mfg. Co.

Cars, Gas, Rail
- Brill Co., J. G., The
- St. Louis Car Co.

Cars, Second Hand
- Abel, G. T.
- Albany Southern R. R. Co.
- Buffalo House Wrecking & Salvage Co.
- Electric Equipment Co.
- Transit Equipment Co.

Cars, Self-Propelled
- Brill Co., J. G., The
- General Electric Co.

Car Wheels, Rolled Steel
- Bethlehem Steel Co.

Castings, Brass, Composition or Copper
- Anderson Mfg. Co., A. & J. M.
- More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
- Bemis Car Truck Co.
- St. Louis Car Co.

Castings, Malleable and Brass
- Amer. Br. Shoe & Fdy. Co.
- Bemis Car Truck Co.
- St. Louis Car Co.

Catchers and Retrievers, Trolley
- Elec. Service Supplies Co.
- Ohio Brass Co.
- Wood Co., Chas. N.

Catenary Construction
- Archbold-Brady Co.

Change Carriers
- Cleveland Fare Box Co.

Circuit-Breakers
- General Electric Co.
- Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
- Anderson Mfg. Co., A. & J. M.
- Elec. Ry. Equipment Co.
- Elec. Ry. Improvement Co.
- Elec. Service Supplies Co.
- General Electric Co.
- Hubbard & Co.
- Ohio Brass Co.
- Westinghouse E. & M. Co.

Cleaners and Scrapers Track (See also Snow-Plows, Sweepers and Brooms)
- Brill Co., The J. G.
- St. Louis Car Co.

Clusters and Sockets
- General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
- Elec. Service Supplies Co.

Coils Armature and Field
- General Electric Co.
- Westinghouse E. & M. Co.

Coils, Choke and Kicking
- Elec. Service Supplies Co.
- General Electric Co.
- Westinghouse E. & M. Co.

Coin Counting Machines
- Cleveland Fare Box Co.
- Intern'l Register Co.
- Johnson Fare Box Co.

Coin Sorting Machines
- Cleveland Fare Box Co.

Coin Wrappers
- Cleveland Fare Box Co.

Commutator Slotters
- Elec. Service Supplies Co.
- General Electric Co.
- Westinghouse E. & M. Co.

Commutator Truing Devices
- General Electric Co.

Commutators or Parts
- Cameron Elec'l Mfg. Co.
- General Electric Co.
- Westinghouse E & M. Co.

Compressors, Air
- Allis-Chalmers Mfg. Co.
- General Electric Co.
- Ingersoll-Rand Co.
- Westinghouse Tr. Br. Co.

Compressors, Air Portable
- Ingersoll-Rand Co.

Concrete Flooring, Surface
- Irving Iron Works

Condensor Papers
- Irvington Varnish & Ins. Co.

Condensers
- Allis-Chalmers Mfg. Co.
- General Electric Co.
- Ingersoll-Rand Co.
- Westinghouse E. & M. Co.

Connectors, Solderless
- Westinghouse E. & M. Co.

Connectors, Trailer Car
- Consolidated Car Heat. Co.
- Elec. Service Supplies Co.
- Ohio Brass Co.

Controllers or Parts
- Allis-Chalmers Mfg. Co.
- General Electric Co.
- Westinghouse E. & M. Co.

Controller Regulators
- Elec. Service Supplies Co.

Controlling Systems
- General Electric Co.
- Westinghouse E. & M. Co.

Converters, Rotary
- Allis-Chalmers Mfg. Co.
- General Electric Co.
- Westinghouse E. & M. Co.

Copper Wire
- Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
- Brill Co., The J. G.
- Elec. Service Supplies Co.
- Internat'l Register Co., The
- Roebling's Sons Co., John A.
- St. Louis Car Co.
- Samson Cordage Works

Cord Connectors and Couplers
- Elec. Service Supplies Co.
- Samson Cordage Works
- Wood Co., Chas. N.

Couplers, Car
- Brill Co., The J. G.
- Ohio Brass Co.
- St. Louis Car Co.
- Westinghouse Tr. Br. Co.

Cranes
- Allis-Chalmers Mfg. Co.
- Universal Crane Co.

Cranes, Locomotive
- Universal Crane Co.

Cranes, Motor Truck
- Universal Crane Co.

Cranes, Portable
- Universal Crane Co.

Cranes, Gasoline or Electric
- Universal Crane Co.

Cross Arms (See Brackets)

Crossing Foundations
- International Steel Tie Co.

Crossing, Frog & Switch
- Ramapo Ajax Corp.

Crossing, Manganese
- Bethlehem Steel Co.
- Ramapo Ajax Corp.

Crossings
- Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
- Ohio Brass Co.

Curtains & Curtain Fixtures
- Brill Co., The J. G.
- Elec. Service Supplies Co.
- Morton Mfg. Co.
- St. Louis Car Co.

Dealer's Machinery
- Elec. Equipment Co.
- Jones-McKee, Inc.
- Zelnicker Supply Co., Walter A.

Derailing Devices (See also Track Work)

Derailing Switches
- Ramapo Ajax Corp.

Destination Signs
- Elec. Service Supplies Co.

Detective Service
- Wish-Service, P. Edward

Door Operating Devices
- Brill Co., The J. G.
- General Electric Co.
- Hale-Kilburn Co.
- St. Louis Car Co.
- Safety Car Devices Co.

Doors & Door Fixtures
- Brill Co., The J. G.
- Consolidated Car Heati'g Co.
- General Electric Co.
- Hale-Kilburn Co.
- Morton Mfg. Co.
- Nat'l Pneumatic Co., Inc.

Doors, Folding Vestibule
- Nat'l Pneumatic Co., Inc.
- Safety Car Devices Co.

Drills, Rock
- Ingersoll-Rand Co.

Drills, Track
- Amer. Steel & Wire Co.
- Elec. Service Supplies Co.
- Ingersoll-Rand Co.
- Ohio Brass Co.

Dryers, Sand
- Elec. Service Supplies Co.

Ears
- Ohio Brass Co.

Electrical Wires and Cables
- Amer. Electrical Works
- Amer. Steel & Wire Co.
- Roebling's Sons & Co., J. A.

Electric Grinders
- Railway Track-work Co.

Electrodes, Carbon
- Railway Track-work Co.

Electrodes, Steel
- Railway Track-work Co.

Enamels
- Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
- Allison & Co., J. S.
- Archbold-Brady Co.
- Arnold Co., The
- Beeler, John A.
- Bibbins, J. Rowland
- Buchanan & Lay Corp.
- Byllesby & Co., H. M.
- Day & Zimmerman, Inc.
- Drum & Co., A. L.
- Ford, Bacon & Davis
- Hemphill & Wells
- Holst, Engelhardt W.
- Jackson, Walter
- Ong, Joe R.
- Parsons, Klapp, Brinkerhoff & Douglas
- Richey, Albert S.
- Sanderson & Porter
- Sangster & Co., A.
- Stevens & Wood
- Stone & Webster
- White Eng. Corp., The J. G.
- Wortham, Edwin

Engines, Gas, Oil or Steam
- Allis-Chalmers Mfg. Co.
- Ingersoll-Rand Co.
- Westinghouse E. & M. Co.

Fare Boxes
- Cleveland Fare Box Co.
- Johnson Fare Box Co.
- Nat'l Ry. Appliance Co.

Fare Registers
- Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
- Cyclone Fence Co.
- Amer. Steel & Wire Co.

Fenders and Wheel Guards
- Brill Co., The J. G.
- Consolidated Car Fender Co.
- Elec. Service Supplies Co.
- St. Louis Car Co.

Fibre and Fibre Tubing
- Westinghouse E. & M. Co.

Field Coils (See Coils)

Flangeway Guards, Steel
- Godwin Co., Inc., W. S.

Flooring, Fireproof
- Irving Iron Works

Flooring, Non-Slipping
- Irving Iron Works

Flooring, Open Steel
- Irving Iron Works

Flooring Steel, Subway
- Irving Iron Works

Flooring, Ventilating
- Irving Iron Works

Forgings
- Brill Co., J. G., The

Frogs & Crossings, Tee Rail
- Bethlehem Steel Co.
- Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
- Ohio Brass Co.

Fuses and Fuse Boxes
- Consolidated Car Heati'g Co.
- General Electric Co.
- Westinghouse E. & M. Co.

Fuses, Refillable
- General Electric Co.

Gaskets
- Westinghouse Tr. Br. Co.

Gas Producers
- Westinghouse E. & M. Co.

Gas-Electric Cars
- General Elec. Co.
- Westinghouse E. & M. Co.

Gates, Car
- Brill Co., The J. G.
- St. Louis Car Co.

Gear Blanks
- Bethlehem Steel Co.
- Brill Co., J. G., The

Gear Cases
- Chillingworth Mfg. Co.
- Elec. Service Supplies Co.
- Westinghouse E. & M. Co.

Gears and Pinions
- Bemis Car Truck Co.
- Bethlehem Steel Co.
- Elec. Service Supplies Co.
- General Electric Co.
- Nat'l Ry. Appliance Co.
- Nuttall Co., R. D.
- Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
- General Electric Co.

Generators
- Allis-Chalmers Mfg. Co.
- General Electric Co.
- Westinghouse E. & M. Co.

Girder Rails
- Bethlehem Steel Co.
- Lorain Steel Co.

Gong (See Bells and Gongs)

Grating, Steel Subway
- Irving Iron Works

Greases (See Lubricants)

Grinders and Grind. Supplies
- Railway Track-work Co.

Grinders, Portable
- Railway Track-work Co.

Grinders, Portable Electric
- Railway Track-work Co.

Grinding Bricks and Wheels
- Railway Track-work Co.

Guard Rail Clamps
- Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
- Ramapo Ajax Corp.

Guards, Trolley
- Elec. Service Supplies Co.
- Ohio Brass Co.

Hammers, Pneumatic
- Ingersoll-Rand Co.

Harps, Trolley
- Anderson Mfg. Co., A.&J.M
- Elec. Service Supplies Co.
- More-Jones Brass Metal Co.
- Nuttall Co., R. D.
- Star Brass Works

Headlights
- Elec. Service Supplies Co.
- General Electric Co.
- Ohio Brass Co.
- St. Louis Car Co.

Heaters, Car (Electric)
- Consolidated Car Heati'g Co.
- Gold Car Heat. & Ltg. Co.
- Nat'l Ry. Appliance Co., P.
- Smith Heater Co., Peter

Helmets—Welding
- Railway Track-work Co.

Heaters, Car, Hot Air and Water
- Elec. Service Supplies Co.
- Smith Heater Co., Peter

Hoists, Portable
- Ingersoll-Rand Co.

Hydraulic Machinery
- Allis-Chalmers Mfg. Co.

Indicating Signals
- Oskel Equipment Co.

Instruments Measuring, Testing and Recording
- Elec. Service Supplies Co.
- General Electric Co.
- Westinghouse E. & M. Co

Insulating Cloth, Paper and Tape
- General Electric Co.
- Irvington Varnish & Ins. Co.
- Okonite Co.
- Stand. Underground Cable Co.
- Westinghouse E & M Co.

Insulating, Silk & Varnish
- Irvington Varnish & Ins. Co.

Insulation (See also Paints)
- Electric Ry. Equipment Co.
- Elec. Service Supplies Co.
- General Electric Co
- Irvington Varnish & Ins. Co.
- Okonite Co.
- Westinghouse E. & M. Co.

Insulation Slots
- Irvington Varnish & Ins. Co.

Insulators (See also Line Materials)
- Elec. Ry. Equipment Co
- Elec. Service Supplies Co.
- General Electric Co
- Irvington Varnish & Ins. Co
- Ohio Brass Co.
- Westinghouse E. & M. Co.

Insulator Pins
- Elec. Service Supplies Co.
- Hubbard & Co.

Insulators, High Voltage
- Lapp Insulator Co., Inc.

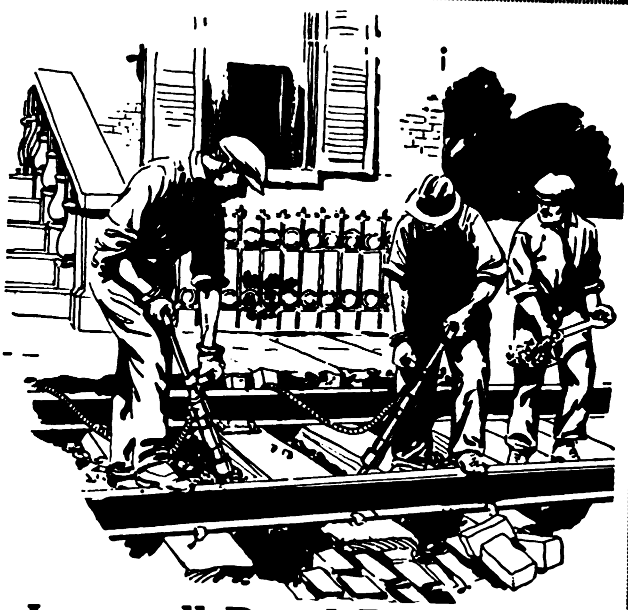
You're having brush trouble

CORRECT IT
USE LE CARBONE CARBON BRUSHES

They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto



Ingersoll-Rand Pneumatic Tie Tampers

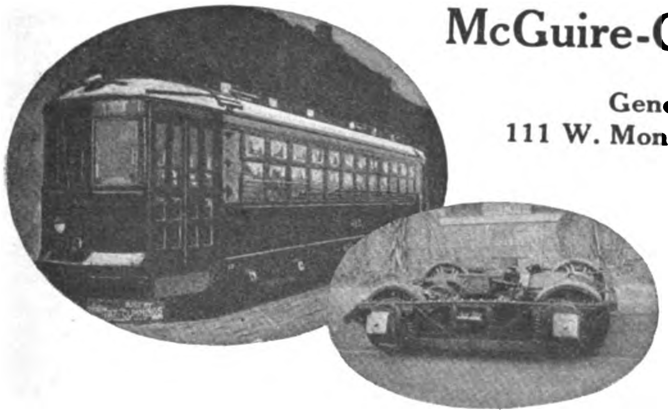
Reduce track tamping and maintenance costs.

Ask for Bulletin 9123

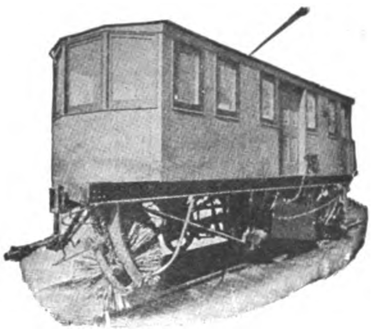
INGERSOLL-RAND COMPANY
11 Broadway, New York
170-TT

McGuire-Cummings Manufacturing Co.

General Offices:
111 W. Monroe St., Chicago, Ill.



Street Cars
Trucks
Snow Sweepers



B. A. HEGEMAN, Jr., President C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.
Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

TULC A LUBRICANT

We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC
on your equipment

The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

Jacks (See also Cranes, Hoists and Lifts)
Buckeye Jack Co.
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.
Ohio Brass Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Protection
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson Mfg. Co., A.&J.M.
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locomotives, Electric
General Electric Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricating Engineers
Galena Signal Oil Co.
Texas Co., The
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co.
Texas Co., The
Universal Lubricating Co.

Manganse Steel, Special Track Work
Bethlehem Steel Co.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel Switches Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters (See Instruments)

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses (See Buses, Motor)

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
General Electric Co.

Motormen's Seats
Allis-Chalmers Mfg. Co.
Brill Co., J. G.
Elec. Service Sup. Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Hubbard & Co.

Oils (See Lubricants).

Omnibuses (See Buses, Motor)

Oxygen
International Oxygen Co.

Oxy-Acetylene (See Cutting Apparatus, Oxy-Acetylene)

Packing
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Paints and Varnishes (Insulating)
Irvington Varnish & Ins. Co.

Paints, Varnishes, Preservatives
Beckwith-Chandler Co.

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co

Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdy. Co

Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Elec. Ry. Equipment Co.
Hubbard & Co.

Pole Reinforcing
Hubbard & Co.

Poles & Ties Treated
Bell Lumber Co.
Baker Wood Preserving Co.
International Creosoting & Construction Co.

Poles, Ties, Posts, Piling & Lumber
Baker Wood Preserving Co
Bell Lumber Co.
International Creosoting & Construction Co.

Poles, Trolley
Bell Lumber Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

Porcelain Special High Voltage
Lapp Insulator Co., Inc.

Potheads
Okonite Co.

Power Saving Devices
National Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.

Rail Joints—Welded
Lorain Steel Co.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Rail Welding
Railway Track-work Co.

Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Ohmer Fare Register Co.
Rooke Automatic Rg. Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Elec. Service Sup. Co.

Resistances
Consolidated Car Heat. Co.

Resistance, Wire and Tube
General Electric Co.
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Sanders, Track
Brill Co., The J. G.
Elec. Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
St. Louis Car Co.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.

Seats, Bus
Brill Co., J. G., The
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co, The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co.
Hyman-Michaels Co.
Transit Equipment Co.
Zelnicker Supply Co., Walter A.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings, Center and Side)

Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Highway Crossing
Elec. Service Sup. Co.
Nachod Signal Co., Inc.
Wood Co., Chas. N.

Signal Systems, Block
Nachod Signal Co., Inc.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A.&J.M.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
More-Jones Metal & Brass Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Irvington Varnish & Ins. Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Stair Steps, Safety
Irving Iron Works

Steel and Steel Products
Carnegie Steel Co.

Steps, Car
Brill Co., J. G., The
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Superheaters
Babcock & Wilcox Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Switches and Switchboards
Anderson Mfg. Co., A. & J.M.
Allis-Chalmers Mfg. Co.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Tamper Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.
Western Electric Co.

Terminals, Cable
Std. Underground Cable Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heat. Co.
Cold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

Ties, All-Metal
Metal Safety R. R. Tie Co.

Ties and Tie Rods, Steel
Carnegie Steel Co.
International Steel Tie Co.

Tool Steel
Bethlehem Steel Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Torches, Acetylene (See Cutting Apparatus)

Tower Wagons and Auto Trucks
McCardell & Co., J. R.

Towers and Transmission Structures
Archbold-Brady Co.
Westinghouse E. & M. Co.

Track Grinders
Railway Track-work Co.

Trackless Trolley Cars
Brill Co., J. G., The
St. Louis Car Co.

Track, Special Work
Bethlehem Steel Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr. & Co., Inc., W.

Transfer (See Tickets)

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Elec. Service Supplies Co
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Material, Overhead
More-Jones Brass & Metal Co.
Ohio Brass Co.
Eloc. Service Supplies Co.

Trolley Wheel Bushings
More-Jones Brass & Metal Co.

Trolley Wheel & Harps
More-Jones Brass & Metal Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Roebling's Sons Co., J. A.

Trucks, Automobile
White Co.

Trucks, Car
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Tubing, Yellow & Black Flexible Varnish
Irvington Varnish & Ins. Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Turbines, Water
Allis-Chalmers Mfg. Co.

Turnstiles
Elec. Service Supplies Co.
Percy Mfg. Co., Inc.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers & Silks
Irvington Varnish & Ins. Co.

Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Welded Rail Joints
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welders, Portable Electric
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welding & Cutting Tools
International Oxygen Co.

Welding Processes and Apparatus
Elec. Ry. Improvement Co.
General Electric Co.
International Oxygen Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Welding Steel
Elec. Ry. Improvement Co.
Railway Track-work Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.
Carnegie Steel Co.
Griffin Wheel Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Wheels, Trolley
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Wire Rope
Roebling's Sons Co., J. A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co.
Roebling's Sons Co., J. A.
Std. Underground Cable Co.
Westinghouse E. & M. Co.

Wood Preservatives
Baker Wood Preservative Co.

Woodworking Machines
Allis-Chalmers Mfg Co.

T. S. Q.

Says

"They don't shop and overhaul the cars as often since I've been on the job"

Tool Steel Quality

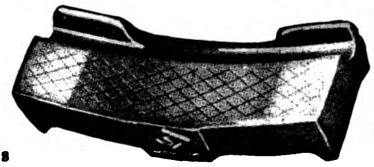
The Tool Steel
Gear and Pinion Co.
CINCINNATI, O.

Brake Shoes
A.E.R.A. Standards

Diamond "S" Steel Back is the Best Type

Standard
Patterns
for

SAFETY
CAR

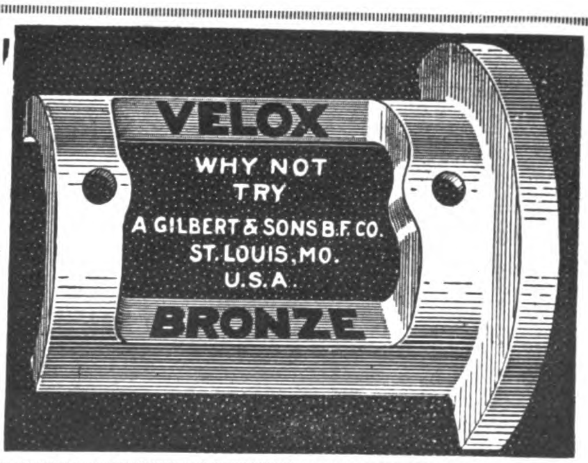


D-67 for Narrow Treads
D-87 for Wide Treads

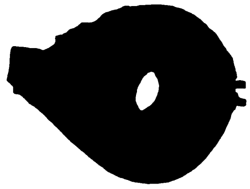
American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.

CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.



Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars
Perey Manufacturing Co., Inc.
30 Church Street, New York City



CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. Write Us.
Chillingworth Mfg. Co.
Jersey City, N. J.

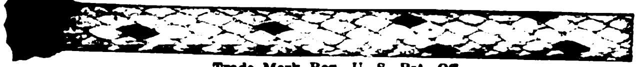
"Boyerized" Products Reduce Maintenance

Bemis Trucks
Case Hardened Brake Pins
Case Hardened Bushings
Case Hardened Nuts and Bolts
Manganese Brake Heads
Manganese Transom Plates
Manganese Body Bushings
Bronze Axle Bearings

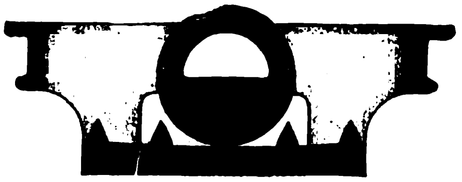
Bemis Pins are absolutely smooth and true in diameter. We carry 40 different sizes of case hardened pins in stock. Samples furnished. Write for full data.

Bemis Car Truck Co., Springfield, Mass.

SAMSON SPOT WATERPROOFED TROLLEY CORD



Trade Mark Reg. U. S. Pat. Off.
Made of extra quality stock firmly braided and smoothly finished. Carefully inspected and guaranteed free from flaws. Samples and information gladly sent.
SAMSON CORDAGE WORKS, BOSTON, MASS.



STUCKI
SIDE
BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page

A

Allis-Chalmers Mfg. Co. 32
Allison Co., J. E. 23
Amer. Brake Shoe & Fdy. Co. 39
American Car Co. 41
American Electrical Works 30
American Steel & Wire Co. 32
Anaconda Copper Mining Co. 30
Anderson Mfg. Co., A. & J. M. 30
Archbold-Brady Co. 23
Arnold Co., The 22

B

Babcock & Wilcox Co. 32
Baker Wood Preserving Co. 31
Beckwith Chandler Co. 32
Beeler, John A. 22
Bell Lumber Co. 40
Bemis Car Truck Co. 39
Bethlehem Steel Co. 30
Bibbins, J. Rowland 22
Bonney Vehslage Tool Co. 40
Brill Co., J. G. 41
Buchanan & Layng Corp. 23
Buckeye Jack Mfg. Co. 33
Byllesby & Co., H. M. 23

C

Cameron Electrical Mfg. Co. 32
Carnegie Steel Co. 14
Chillingworth Mfg. Co. 39
Cleveland Fare Box Co. 33
Collier, Inc., Barron G. Co. 26
Consolidated Car Fender Co. 40
Consolidated Car Heating Co. 40
Cyclone Fence Co. 27

D

Day & Zimmermann Co., Inc. 22
Differential Steel Car Co. 33

E

Electric Equipment Co. 35
Electric Railway Equipment Co. 30
Electric Ry. Improvement Co. 32
Electric Service Supplies Co. 11

F

Ford, Bacon & Davis 22
"For Sale" Ads 35

G

Galena-Signal Oil Co. 17
General Electric Co. 18, Back Cover
Gilbert & Sons Brass Foundry Co., A. 39
Godwin Co., W. S. 31
Gold Car Heating & Ltg. Co. 33
Griffin Wheel Co. 34

H

Hale-Kilburn Company 34
"Help Wanted" Ads 35
Hemphill & Wells 22
Heywood-Wakefield Co. 33
Holst, Englehard W. 22
Hubbard & Co. 30
Hyman-Michaels Co. 35

I

Ingersoll-Rand Co. 37
International Creosoting & Construction Co. 16
International Oxygen Co. 32
International Register Co., The 33
International Steel Tie Co. 9
Irving Iron Works Co. 28
Irvington Varnish & Insulator Co. 34

J

Jackson, Walter 22
Jeandron, W. J. 37
Johnson & Co., J. R. 39
Johnson Fare Box Co. 34

K

Kerite Ins. Wire & Cable Co. 31
Kuhlman Car Co. 41

L

Lapp Insulator Co., Inc. 30
Le Carbone Co. 37
Lorain Steel Co. 31

M

McGraw-Hill Book Co., Inc. 28
McGuire Cummings Mfg. Co. 37
Metal Safety Railway Tie Co. 31
More-Jones Brass & Metal Co. 34
Morton Mfg. Co. 40

N

Nachod Signal Co., Inc. 31
National Brake Co., Inc. 21
National Pneumatic Co., Inc. 13
National Railway Appliance Co. 37
New York Switch & Crossing Co. 31
Nichols, Lintern Co. 40
Nuttall Co., R. D. 23

O

Ohio Brass Co. 7
Ohmer Fare Register Co. 33
Okonite Co., The 30
Ong, Joe R. 22
Oskel Equipment Co. 40

P

Parsons, Klapp, Brinckerhoff & Douglas 22
Percy Mfg. Co. 39
Postiions Wanted and Vacant 35

R

Railway Track-work Co. 6
Railway Utility Co. 34
Ramapo-Ajax Co. 31
Richey, Albert S. 22
Roebling's Sons Co., John A. 30
Rooke Automatic Register Co. 33

S

St. Louis Car Co. 29
Safety Car Devices Co. 8
Samson Cordage Works 39
Sanderson & Porter 22
Searchlight Section 35
Shaw, Henry M. 30
Smith Heater Co., Peter, The 33
Standard Underground Cable Co. 30
Star Brass Works 33
Stone & Webster 22
Stevens & Wood, Inc. 22
Stucki & Co., A. 39

T

Texas Co., The 15
Tool Steel Gear & Pinion Co. 39
Transit Equipment Co. 35

U

Universal Crane Co. 40
Universal Lubricating Co. 37
United States Graphite Co. 34

W

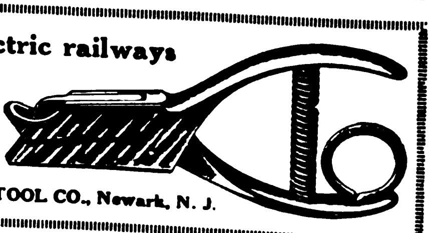
"Want" Ads 35
Wason Mfg. Co. 41
Wesinghouse Elec. & Mfg. Co. 2, 4-5
Westinghouse Traction Brake Co. 10
White Co., The Front Cover
White Engineering Corp., The J. G. 22
Wish Service, The P. Edw. 23
Wood Co., Chas. N. 30
Wortham, Edwin 23

Z

Zelnicker Supply Co., W. A. 35

UNIVERSAL
CRANES
Full Revolving
No Outriggers
Motor Truck Mounting
Send for Bulletin No. 22
The Universal Crane Co., 1192 Swetland Bldg., Cleveland, O.

STOP
"OSKELITE"
The Stop Light for street cars. Operates from brake system. Details on request.
The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.



75% of the electric railways use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.

100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

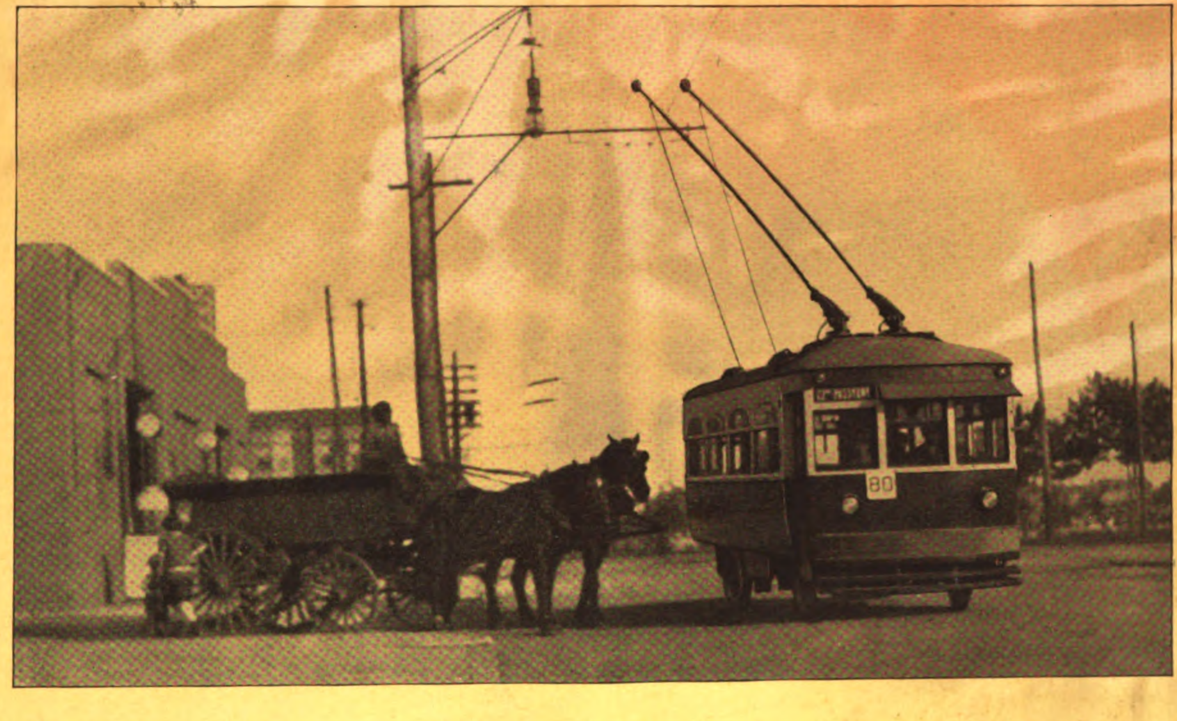
Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

PROVIDENCE FENDERS
H-B LIFE GUARDS
The Consolidated Car Fender Co., Providence, R. I.
Wendell & MacDuffie Co., 110 E. 42nd St., New York
General Sales Agents

ELECTRIC CAR HEATERS
THERMOSTATS BUZZERS
PNEUMATIC DOOR OPERATORS
CONSOLIDATED CAR-HEATING CO.
NEW YORK ALBANY, N.Y. CHICAGO

N-L VENTILATORS
Write for new catalogue
"Superior Ventilation"
THE NICHOLS-LINTERN COMPANY
7960 Lorain Ave., Cleveland, Ohio.
N-L Products manufactured and sold in Canada by
Railway and Power Engineering Corporation, Ltd.
133 Eastern Avenue, Toronto, Ontario

Brill Rail-less Cars Serve Philadelphia



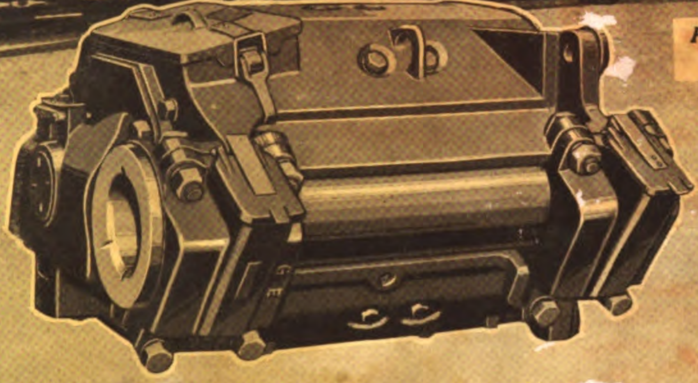
Oregon Avenue Installation acting as feeder line to electric railway cars

To Philadelphia goes the honor of having in operation the largest installation of Rail-less Cars in the United States. All cars operated are of the Brill Rail-less street car type, mounted on Brill Rail-less car chasses, equipped with two 25 Hp. motors. They are furnishing transportation over a route which previously was without public conveyance, and act as feeders to electric lines intersecting with Oregon Avenue.

Brill Rail-less Cars offer electric railways a type of equipment capable of meeting the transportation requirements of new territories adjacent to their lines at comparatively low initial and operating costs.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO. — G. C. KUHLMAN CAR CO. CLEVELAND, OHIO. — WASON MANF'G CO. SPRINGFIELD, MASS.

Present Equipment on the Pasadena Short Line



GE-240 Motor

PC-12 Controller

C-129
Master Controller

Pacific Electric Modernizes

50 Four-Motor GE-240 Equipments with PC Control will soon be in operation on the Pasadena Short Line of the Pacific Electric Railway. The new cars will replace the present rolling stock, also G-E equipped, which has been in continuous service for 20 years.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

25-228

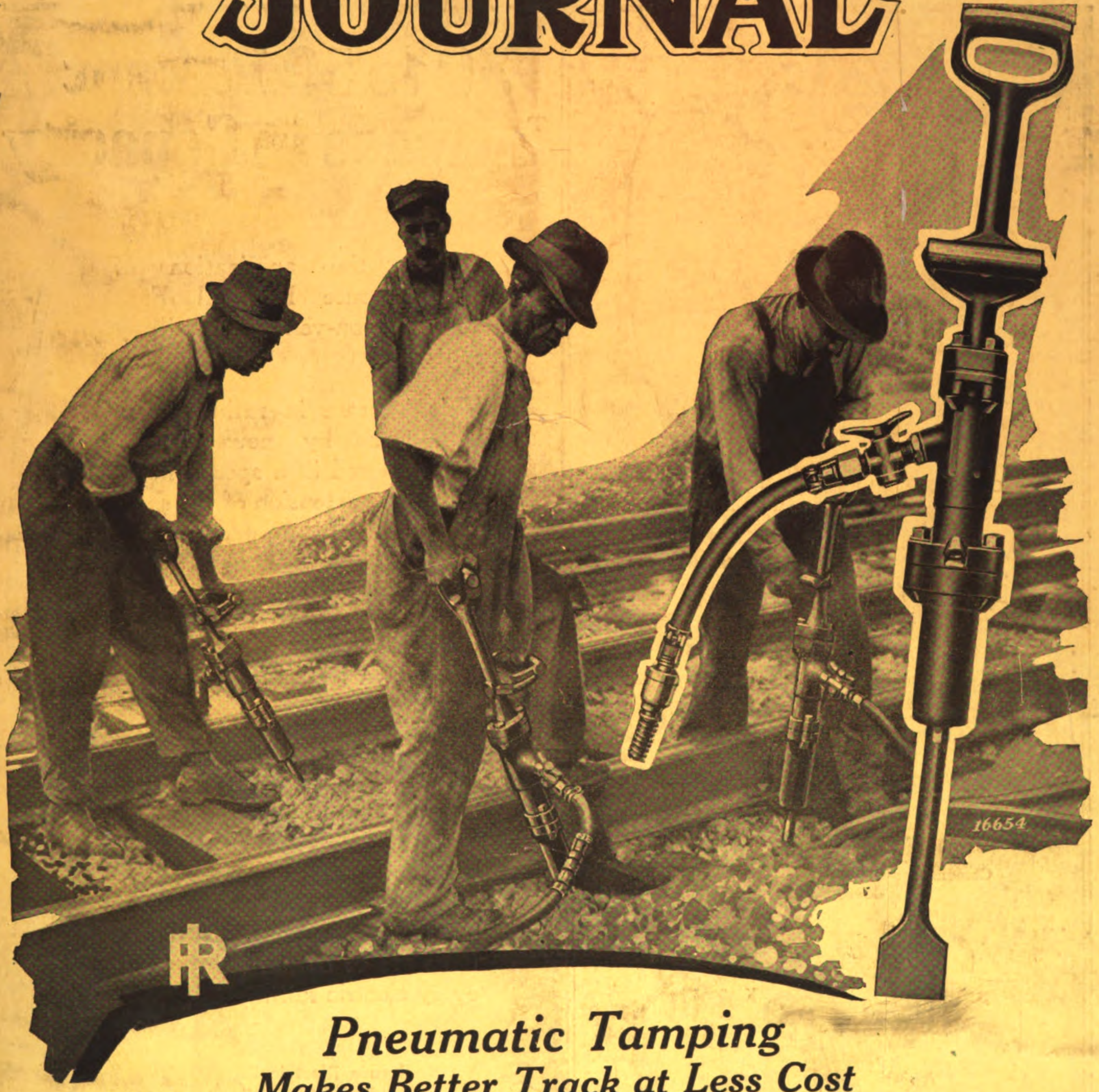
GENERAL ELECTRIC

McGraw-Hill Co., Inc. March 15, 1924 Twenty Cents Per Copy

PROPERTY OF
TECHNICAL PUBLICATIONS LIBRARY
[illegible] SCHOOL OF [illegible]

ELECTRIC RAILWAY JOURNAL

TF
701
.T7



Pneumatic Tamping
Makes Better Track at Less Cost

Pneumatic Tamping is the most efficient and economical way to tamp track. This is proved by hundreds of accurately kept cost records on dozens of roads. Ingersoll-Rand Pneumatic Tie Tampers enable four men to tamp more track and do a better job than twelve to sixteen men working with hand picks and bars. And the track stands up two to three times longer than when tamped by hand.

The Tie Tamper Air Compressors also make possible other savings through the use of "Paving Breakers," Rail Drills, Woodborers, Spike Drivers, Grinders, etc.

INGERSOLL-RAND COMPANY, 11 Broadway, New York

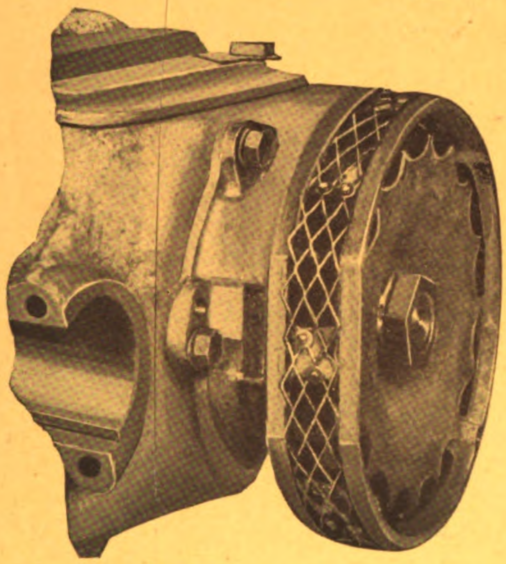
Offices in all principal domestic and foreign cities

For Canada refer—Canadian Ingersoll-Rand Co., Limited, 260 St. James St., Montreal, Quebec.

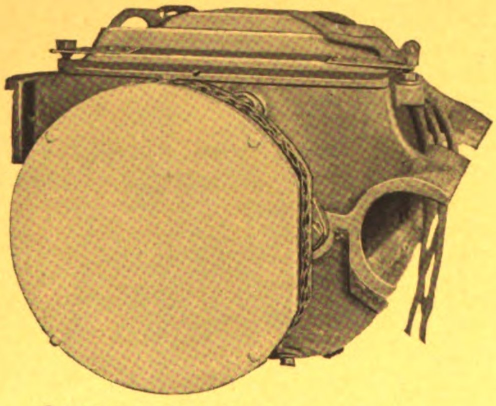
203-TT

Ingersoll-Rand

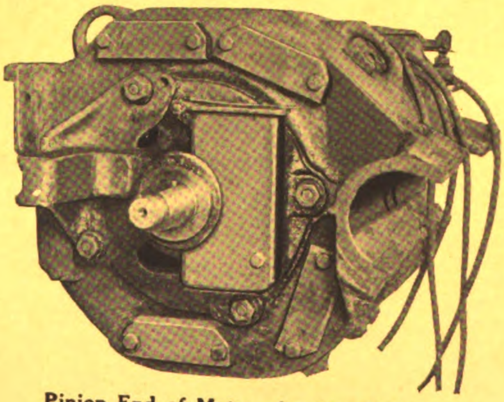
The Westinghouse External Fan



Commutator-End Housing and Fan Chamber Showing External Fan.



Commutator-End Housing with Protecting Cover in place.



Pinion End of Motor, showing Air Intake Openings with covers in place.

30 to 50 Percent Increase in Capacity

follows the application of Westinghouse External Fans to your non-ventilated railway motors.

This increase in rating is accomplished by mounting the fan, enclosed in a special housing, on an extension of the shaft at the commutator end.

The only factors that limit the diameter of the external fan are the clearances of the axle collar and the wheel hub.

The effectiveness of this method of ventilation lies in the quantity of air which is drawn through the commutator-end housing.

All the tools needed to equip your non-ventilated motors with Westinghouse External Fans are to be found in almost every electric railway shop.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pennsylvania

Sales Offices in All Principal Cities of the United States and Foreign Countries

WESTINGHOUSE ELECTRIC

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

Westinghouse

Vol. 63, *No.* 11 New York, March 15, 1924 *Pages* 401-438

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE and **HARRY L. BROWN**, *Editors*

MORRIS BUCK
Associate Editor

C. W. SQUIER
Associate Editor

JOHN A. MILLER, JR.
Assistant Editor

G. J. MACMURRAY
News Editor

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago

MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago

CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 401

Carhouse for 100 Cars at Louisville 403

BY F. H. MILLER.

New structure, which replaces carhouse burned last year, is of reinforced concrete with full sprinkler equipment. Through tracks facilitate car movement. A novel type of double skeleton pits and facilities for car washing are features.

Faster Service and Elimination of Jitney Recommended . 407

In Houston, Tex., shortening of indirect railway routes, the elimination of unnecessary stops and changes in car design to speed up service are recommended as the result of consultant's investigation. Jitneys should be eliminated from competitive service.

"Four-Track" Operation in Providence 411

Co-ordinated service, with buses carrying the local passengers and cars running express, has enabled the United Electric Railways to reduce by five minutes the running time to Olneyville Square. The same fare is charged on both and transfers are issued.

Slump Test Determines Proper Moisture for Concrete .. 413

Supplying Coal for Car Heaters 414

Economic Problems of Car, Bus and Boat Transport in Paris 415

The management corporation of this state-owned system earns slightly more than government bonds of the day. Important improvement is the truckless car. Consolidation improves car-use efficiency.

Snow Loader Is a Great Labor Saver 418

Open Cars Converted into Snow Sweepers 418

Bus Development by the Boston Elevated 419

Association News and Discussion 421

American Association News 422

Maintenance of Equipment 423

News of the Industry 426

Financial and Corporate 430

Traffic and Transportation 433

Personal Items 435

Manufactures and the Markets 437

An Impetus to Maintenance

NEXT week will be published the Annual Maintenance Number, which has come to be one of the outstanding contributions of the ELECTRIC RAILWAY JOURNAL to the industry. A feature of this year's number will be two surveys which will show, first, to what degree electric railway shops fall short of being modern plants, and, second, how modern machine tools can be used to cut shop costs.

These two articles will be quite enlightening. The first mentioned impresses one with the great need for improvement in the equipment of the car shops, as an important part of the industry's modernization program. The second gives definite examples of new uses of machine tools and the use of new types of machine tools in speeding up maintenance work and reducing labor charges.

Another feature will be a picture-story of the variety of material handling machines that can be employed to considerable advantage by electric railways in the several departments. There have been many new machines of this character introduced into railway work in the last year or two, and the pictures will tell the story.

Other articles will deal in an important and practicable way with line and track maintenance work. Extra copies will be printed to supply the usual extra demand for this

Annual
Maintenance
Number

NEXT WEEK MARCH 22

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."
Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingenieria Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

Copyright, 1924, by McGraw-Hill Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

Number of Copies Printed, 6,150 **Advertising Index—Alphabetical, 40; Classified, 36, 38; Searchlight Section, 35**

Mr. Hevenor's Experience

Mr. H. P. Hevenor, consulting engineer, New York, who has had an extensive consulting and contracting experience in connection with electric railway track wrote this for Electric Railway Journal :

"There is only one real method for properly removing corrugation and that is by means of what is known as the Reciprocating grinder which gives a true planing action on the top of the rail.

"Corrugation should be removed as soon as it can be visibly detected or identified, or before it has had an opportunity to loosen or harm the track assembly or the adjacent paving. It will absolutely destroy the track structure and the adjacent paving long before normal depreciation. I might also add that corrugated track is very hard on rolling stock, and the noise caused by corrugation is very annoying to passengers as well as the people living in the vicinity.

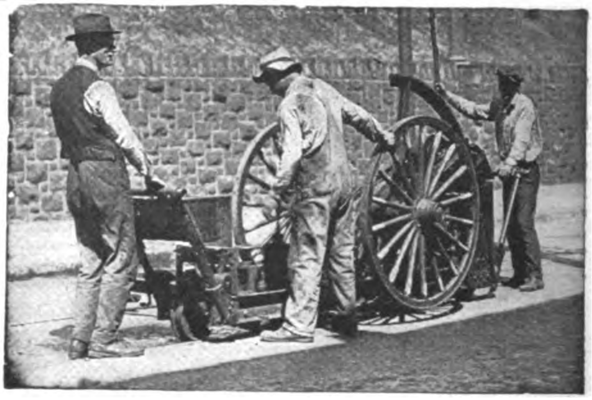
"Unquestionably, all metal removed from the top of the rail, in addition to that of normal wear, will have a tendency to decrease the life of the rail, but if this rail has corrugations on it, it will naturally add to the life of the rail to remove the corrugations."

Any corrugations on your property?
Enough Reciprocating Grinders?

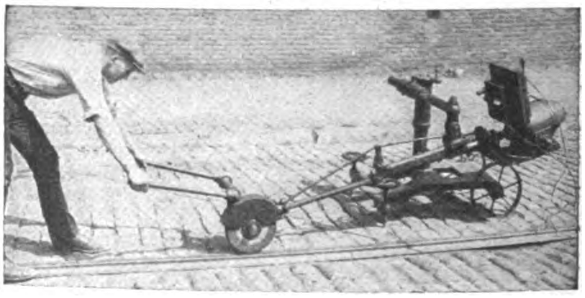
Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

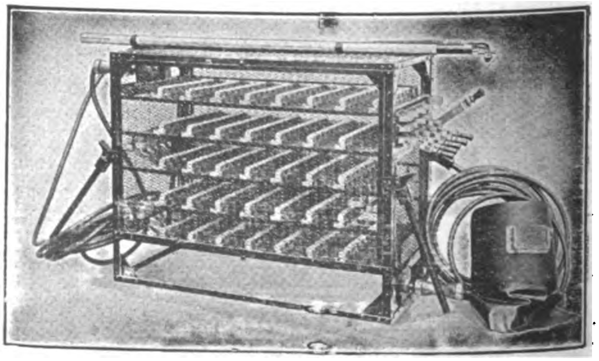
AGENTS:
Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London


"Reciprocating" Track Grinder

"Universal" Rotary Track Grinder


"Hercules" Rail Grinder

ATLAS RAIL GRINDER
"Atlas" Rail Grinder

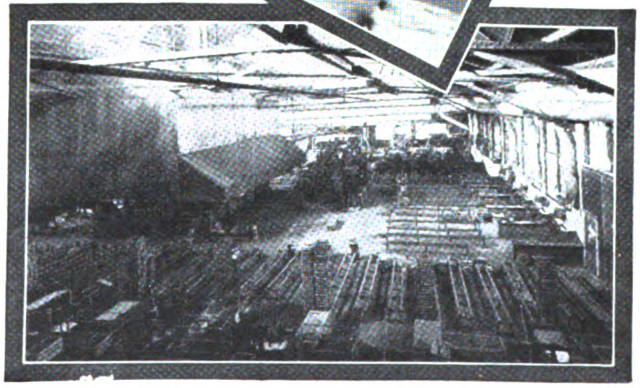

"Ajax" Electric Arc Welder

Accuracy is a By-word

Accuracy is a by-word in the O-B Foundry because tried and proved results have shown what it means to users of O-B Bronze.

Careful procedure is not simply a thing to talk proudly about. It is part of the routine that has been established by a well-posted and effective Technical Department that develops and controls, in close co-operation with the Manufacturing Department, the foundry practice that has made O-B Bronze distinct in its qualities.

Every charge of metal for the furnaces is accurately weighed; *every* pot of molten metal is checked for pouring temperature and no pot is poured until this temperature is exactly right. These regular checks in a well equipped foundry are representative of the care O-B exercises in manufacture and your guarantee of a uniform and high grade bronze in all O-B Products.



THE OHIO BRASS CO.

Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE

WESTINGHOUSE "VARIABLE LOAD" BRAKE

permit change of air in the car
hour sufficient to meet all health requireme

A serious traffic condition that is affecting surface car operation is the increased use of automobiles, and traffic regulation by the Police Department, which makes almost every street intersection a point where congestion or slow movement occurs. Automobiles are able to accelerate to a greater extent than most of the older types of cars, so it seemed desirable to design a car that would afford higher acceleration with a view to keeping pace with other vehicular traffic, and particularly to prevent automobiles in the rear from passing the car until the next stop was reached. To accomplish this, motors were provided to accelerate rapidly at the rate of two miles per hour per second.

To improve the braking efficiency, permitting more rapid deceleration, these cars are equipped with a variable load brake, so named because it provides a braking force, automatically regulated by the weight of the load in the car, thus ensuring a short, uniform stopping distance regardless of whether the car is empty, partly loaded or loaded to capacity. A braking efficiency of one hundred per cent at all times is attained by this apparatus. The use of this type of brake reduces the average time consumed in stopping, and cuts down the running time between stops by allowing a longer peak speed before deceleration begins, thus accomplishing a general speeding up of service. The brake rigging is so arranged that if a fracture should occur in any one rod or lever there would still remain sufficient pressure to stop the car.

The cars are equipped with all the modern safety devices, the most import which is the so-called Dead Man's Handl

Conditions Demanded it—We Supplied it.

The clipping reproduced here is from a recent magazine article dealing with the 200 new cars of the Brooklyn City Railroad. Many other progressive companies are adopting the Variable Load Brake to meet the same conditions as those described in this particular case.

TRADE MARK

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES

Steel Twin Tie Track

TRACK MUST WEAR
But
Must ALL of it
WEAR OUT?

In your 1924 paved track construction plan for wear on rail and paving and plan against *"wear-out"* of your foundations and ties.

Steel Twin Tie Track meets these requirements at an initial cost that is often far below the cost of usual designs. The large effective bearing of the Twin Tie plates provides a support on which rails may wear naturally while the effective bearing of the concrete foundation on the subgrade supports the paving. Then, at the end of a long life of the wearing parts, the renewal does not affect the foundation at all.

The complete details are at your disposal in our proposal folder which will include delivered prices on Twin Ties.

The International Steel Tie Co.
Cleveland, Ohio

Western
Red Cedar Poles

NPCO

Northern
White Cedar Poles

They're off with a splash

On the Way

In the boom ready to be cribbed

A Giant Flume Carries the Poles to Puget Sound

Close to the summit of a mountain, seven miles from Puget Sound, stand several hundred thousand of the finest Western Red Cedar trees that grow.

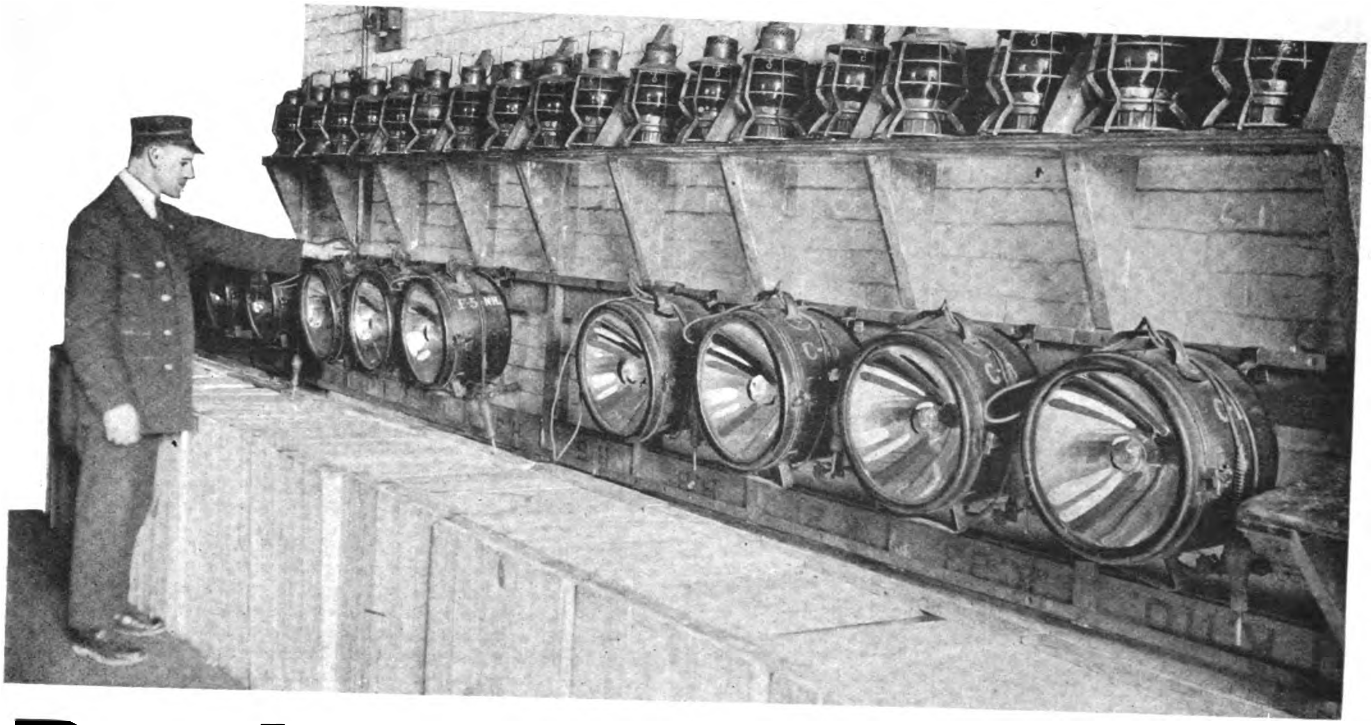
To get these poles to Puget Sound it was necessary to build a great flume down the mountain side and divert water from a mountain stream to carry them down the flume to the Sound, where they are gathered into cribs and towed to the pole-handling yards.

National Pole Company operate at more than forty woods points, maintain four treating plants and nine concentrating and distributing yards. That's why this organization is making possible a delivery service to pole buyers that is unapproachable by any other company in the cedar pole business.

NATIONAL POLE COMPANY

Escanaba, Michigan

Western Electric Company
Incorporated
Offices in 47 principal cities.



Ready for the night runs

GOLDEN GLOW Headlights

MANY companies use "Golden Glows" exclusively! Their golden, penetrating beam of light, free from dangerous glare and dazzling effect, renders them especially valuable in electric railway operation. In such cases, *safety* must be always the prime consideration. And the "Golden Glow" principle is the last word in safety.

Another important consideration—the Golden Glow reflector will not scratch, tarnish or corrode. It is a permanent reflector and easy to keep clean.

Golden Glow Headlights are made in various styles and sizes.

Consult Catalog No. 7

ELECTRIC SERVICE SUPPLIES CO.

PHILADELPHIA
17th and Cambria Sts.

NEW YORK
50 Church St.

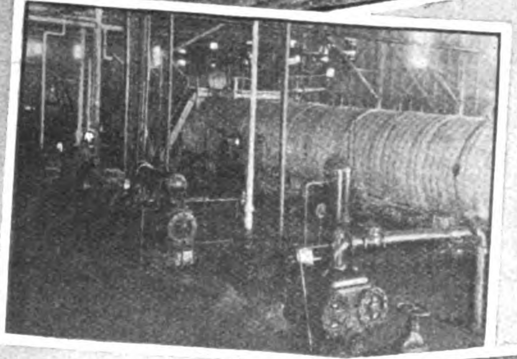
CHICAGO
Monadnock Bldg.

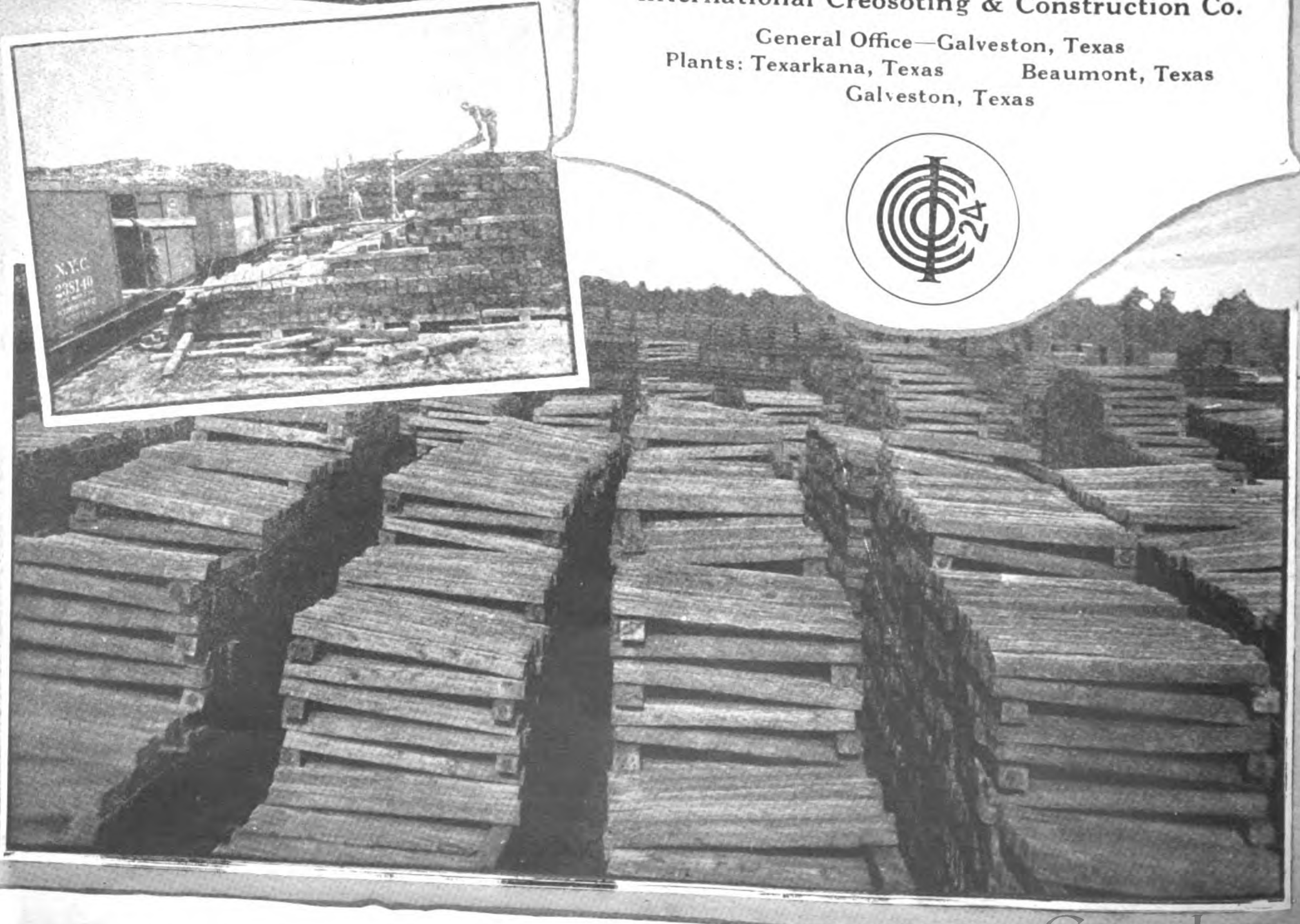
PITTSBURGH
829 Oliver Building

SCRANTON
316 N. Washington Ave.

BOSTON
88 Broad St.

Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver





Here's One Place

Where the Tie Specifications are Strictly Enforced

IN THE woods where ***International*** Ties are produced and at the ***International*** Plants where these ties are treated, the Tie Specifications of the American Railway Engineering Association are strictly enforced. Railway Engineering Officers have drawn specifications to meet their requirements and we—the ***International*** Organization—interpret it as our duty to comply with them in their entirety.

We believe that the uniform and fair enforcement of these specifications by all producers and railroad companies is a move in the right direction, not only to stabilize the tie business and reduce costs but in addition, so that a tie operator can proceed with an orderly, uniform program of production of standard marketable ties prior to the receipt of orders, knowing that if he can not dispose of them to one road, they will be salable to others.

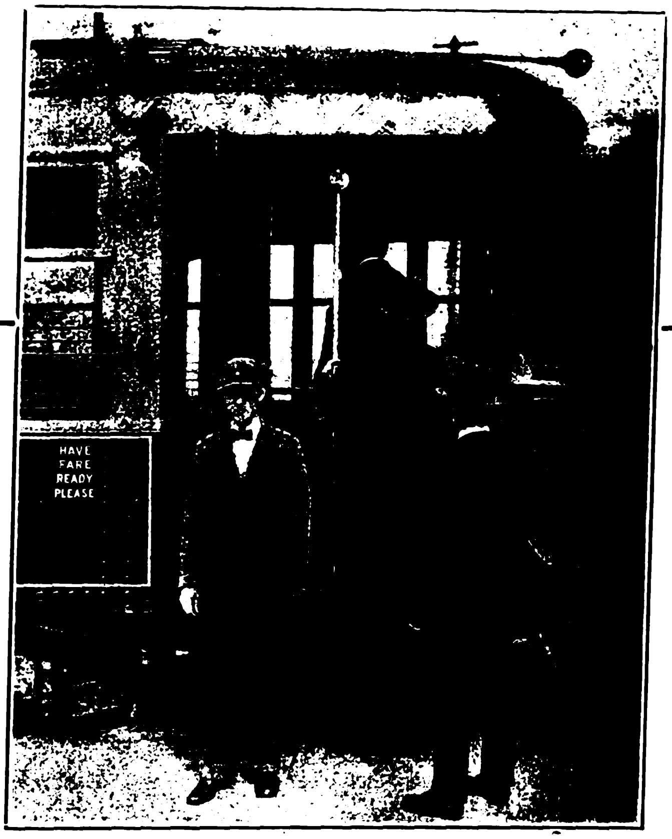
It is to the advantage of the railroads to support these specifications for this reason and also because of the fact that strict and uniform enforcement creates genuine competition and stimulates rivalry.

As an indication of the whole hearted manner in which we have accepted and are supporting these specifications and as a proof of our integrity and our confidence in the grade, quality and service life of ***International*** Ties, we place a copper monogramed dating nail in every tie as a permanent record for your inspection at any time.

Write for full particulars

International Creosoting & Construction Co.

General Office—Galveston, Texas
Plants: Texarkana, Texas Beaumont, Texas
Galveston, Texas



The door that watches itself

Study this photograph!

It shows the new National Pneumatic Automatic Door in actual operation on a Chicago one-man, two-man car.

The passenger has just alighted, and the door can be seen closing without so much as a touch from the motorman or conductor.

At the next stop it will open in the same way—automatically—just as soon as the car has stopped, and a passenger steps on the countersunk treadle in the floor.

Chicago's one-man, two-man, National Pneumatic equipped, *automatic door cars* are one example of progress in improvement and efficiency.

Investigate!

NATIONAL PNEUMATIC AUTOMATIC DOORS

National Pneumatic Company, Inc.

Originators and Manufacturers
PRINCIPAL OFFICE: 50 Church St., NEW YORK
Philadelphia—Colonial Trust Bldg. **Chicago—McCormick Bldg.**
Works—Rahway, New Jersey
Manufactured in Canada by
Dominion Wheel & Foundries, Ltd., Toronto, Ont.

Bates Poles on the United Traction Company Lines at Albany, N. Y.

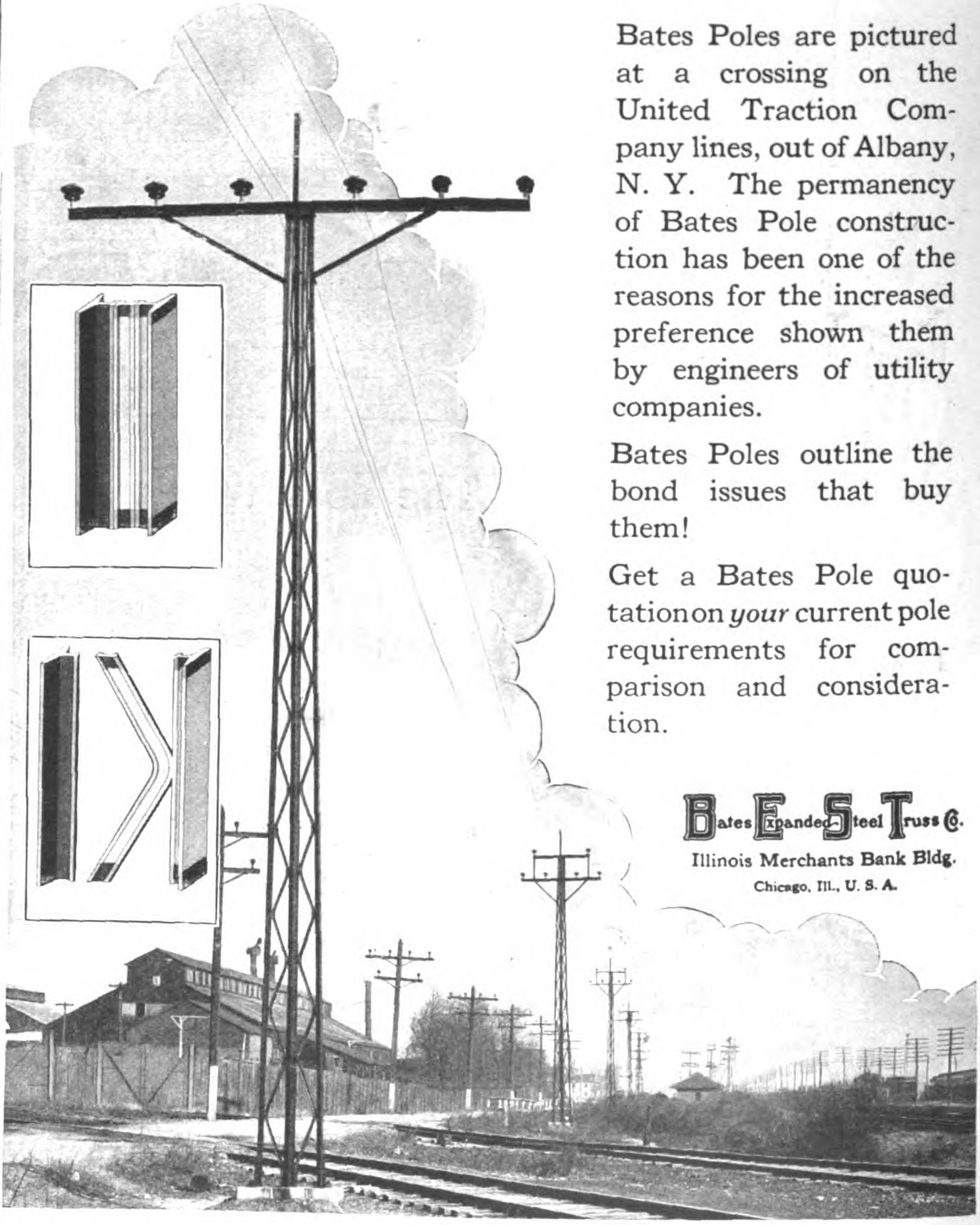
Bates Poles are pictured at a crossing on the United Traction Company lines, out of Albany, N. Y. The permanency of Bates Pole construction has been one of the reasons for the increased preference shown them by engineers of utility companies.

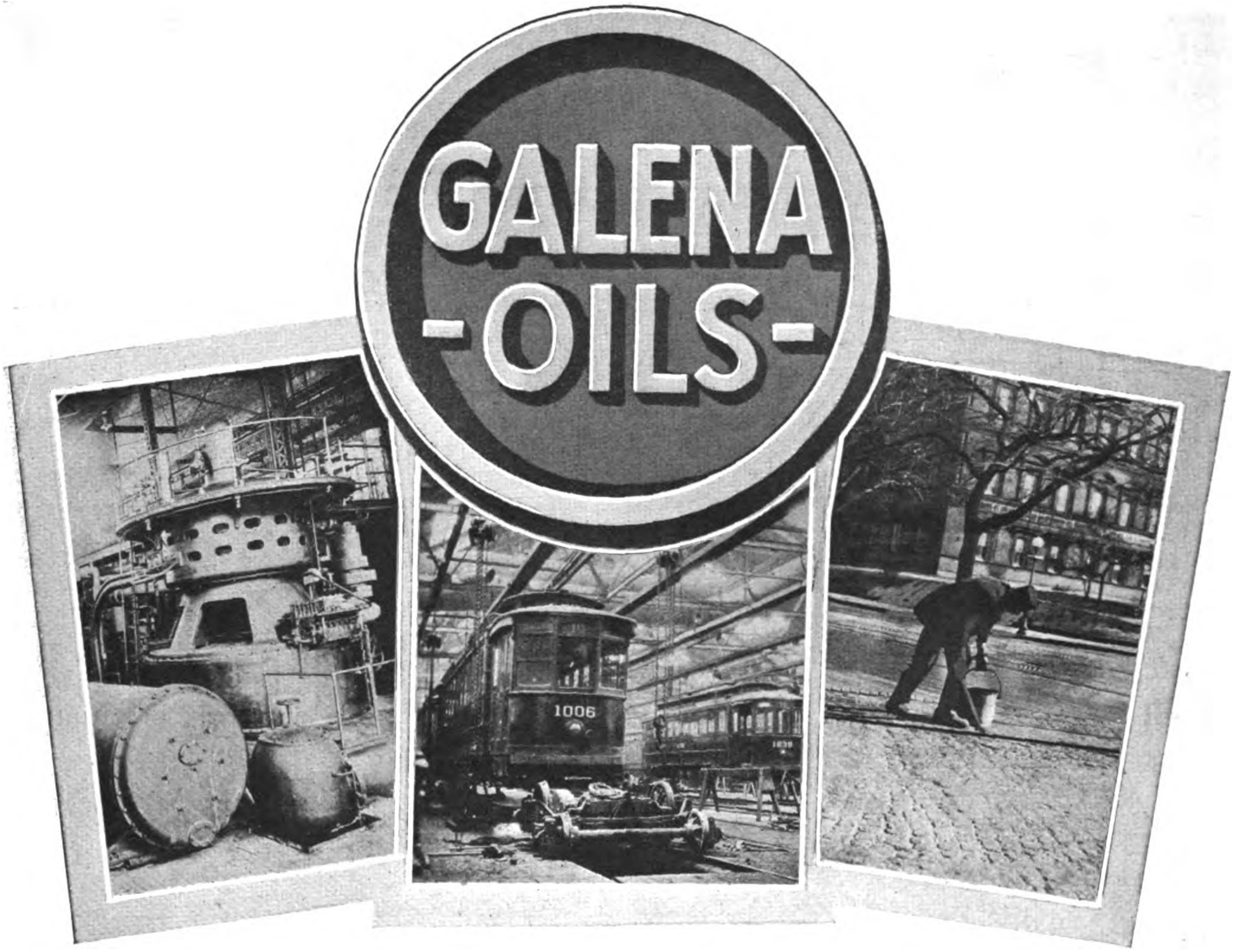
Bates Poles outline the bond issues that buy them!

Get a Bates Pole quotation on *your* current pole requirements for comparison and consideration.

Bates Expanded Steel Truss Co.
Illinois Merchants Bank Bldg.
Chicago, Ill., U. S. A.

BATES ONE PIECE EXPANDED STEEL POLES





Power Dept.—Rolling Stock Dept.—Track Dept.

Galena Service centralizes responsibility for lubrication economies

Galena Service does more than supply oil and grease for every railway requirement. It co-ordinates, simplifies and creates economies throughout the whole lubrication problem.

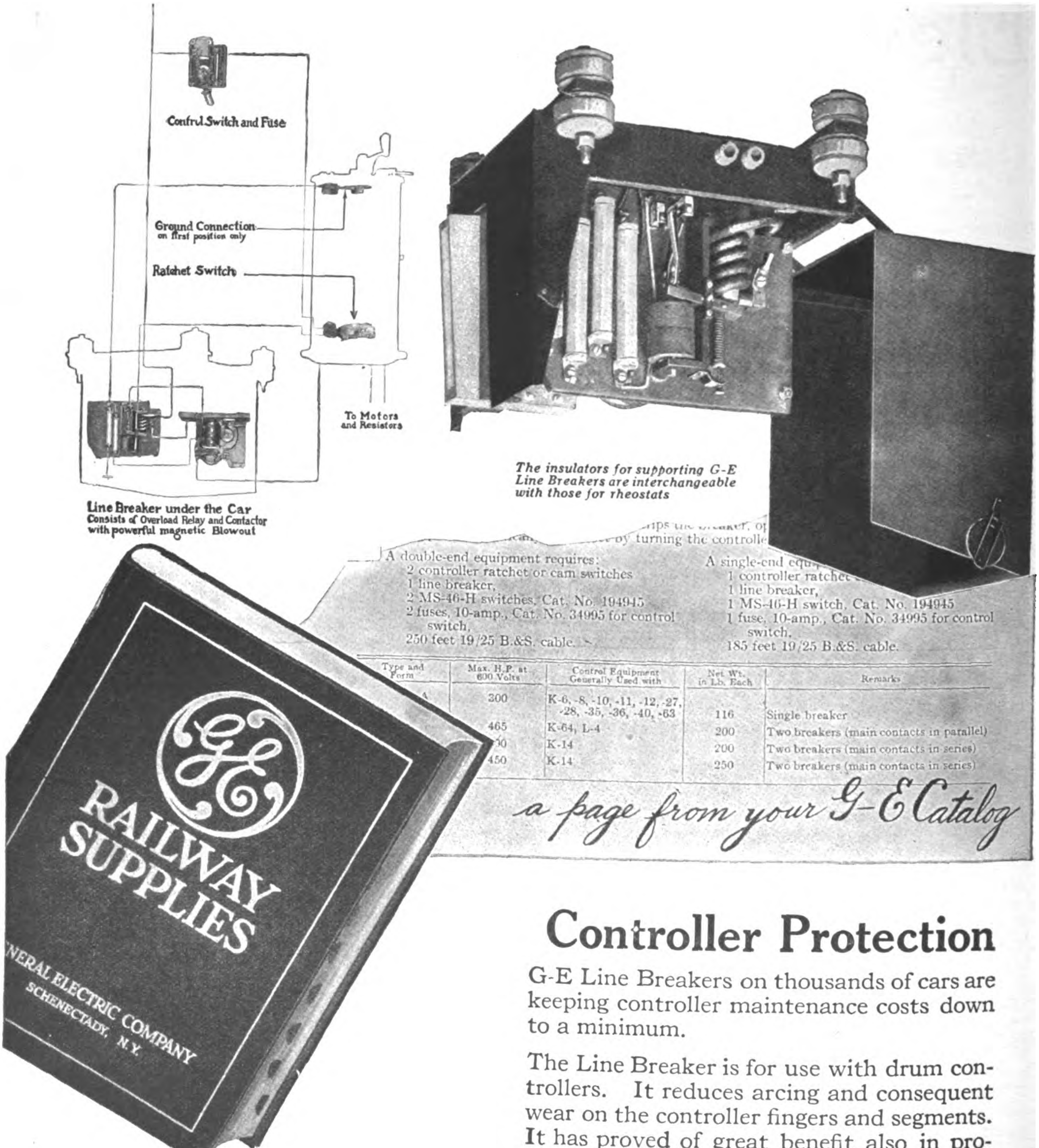
Galena Service affords expert supervision over the supply and use of lubricants from one end of the road to the other.

A Galena contract places responsibility for results on us.

Electric Car Oil
Power House Engine Oil
Power House Valve Oil
Turbine Oils
Dynamo Oils
Air Compressor Oils
Track Oil
Gas Engine Oil
Commutator Oil
Electric Generator Oil
Anti-Friction Triple Valve Oil
Air Brake Compound
Gear Greases
Ball Bearing Grease
Roller Bearing Grease
Motor Grease
Trolley Grease
Solidified Oil
Lubricating Grease
Sponge Grease

Galena-Signal Oil Company

New York Franklin, Pa. Chicago
and offices in principal cities


Control Switch and Fuse
Ground Connection on first position only
Ratchet Switch
To Motors and Resistors
Line Breaker under the Car
Consists of Overload Relay and Contactor with powerful magnetic Blowout
G-E
RAILWAY SUPPLIES
NERAL ELECTRIC COMPANY
SCHENECTADY, N.Y.

The insulators for supporting G-E Line Breakers are interchangeable with those for rheostats

ips the breaker, op
by turning the controlle

A double-end equipment requires:
2 controller ratchet or cam switches
1 line breaker,
2 MS-46-H switches, Cat. No. 194945
2 fuses, 10-amp., Cat. No. 34995 for control switch,
250 feet 19/25 B.&S. cable.

A single-end equ
1 controller ratchet
1 line breaker,
1 MS-46-H switch, Cat. No. 194945
1 fuse, 10-amp., Cat. No. 34995 for control switch,
185 feet 19/25 B.&S. cable.

Type and Form	Max. H.P. at 600 Volts	Control Equipment Generally Used with	Net Wt. in Lb. Each	Remarks
A	300	K-6, -8, -10, -11, -12, -27, -28, -35, -36, -40, -63	116	Single breaker
	465	K-64, L-4	200	Two breakers (main contacts in parallel)
	30	K-14	200	Two breakers (main contacts in series)
	450	K-14	250	Two breakers (main contacts in series)

a page from your G-E Catalog

Controller Protection

G-E Line Breakers on thousands of cars are keeping controller maintenance costs down to a minimum.

The Line Breaker is for use with drum controllers. It reduces arcing and consequent wear on the controller fingers and segments. It has proved of great benefit also in protecting motors from improper acceleration. Since it is installed under the car it removes the arcing nuisance from the platform.

Another desirable feature of the Line Breaker is that it permits the interlocking of doors through the control circuit.

The operation of Line Breaker Equipment is explained in detail in your G-E Railway Supply Catalog. See page 178.

Don't Purchase Supplies at Random

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-301

GENERAL ELECTRIC

New York, March 15, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Company, Inc.
Henry W. Blake and Harry L. Brown, *Editors*

Volume 63
Number 11

Running the Same Old Cars in the Same Old Way

ABOUT the only thing which benefits by being the same today as it was many years ago is some relic of a bygone generation. When a railway man boasts that "We go along in the same old way we have always gone—nothing much that is new or different," it places his company in a class with other antiques. The strange part of it is that some railway executives seem proud to be following such a policy.

It goes without saying that this attitude of pride in being old fashioned is not characteristic of the electric railway industry as a whole. But it is unfortunate that there should be even a few who take that position, because it furnishes ammunition to the critics of the electric railway who decry its usefulness and prophesy its speedy demise.

What a different point of view is that of the president of a railway which recently commenced bus operation. He was asked why the company was planning this move. "Well," he said, "it's something new; that's what the people want. It shows we are doing something besides running the same old cars in the same old way."

Criticism of the railway which sticks firmly to its established customs and makes no changes or improvements is perfectly fair because it is nearly always a question of disinclination to do otherwise rather than inability. That this is so is shown by the fact that it is boasted of, not regretted.

The executive with foresight and courage will find a way to do something new, regardless of the financial condition of the company, and usually such improvements will pay for themselves many times over.

Contracting for Labor on Annual Output Basis

PERHAPS the most interesting idea to Americans in the review of operations of the combined transit system of Paris on page 415 is the plan of handling the time of platform men on the basis of annual instead of daily or weekly output. The limitations set upon the Paris management because of the legal regulations concerning eight-hour days, forty-eight-hour weeks and twenty-one-day vacations certainly called for ingenuity and mutual good feeling if the undertaking was to be operated without an excessive number of extra men. The plan of contracting for a total annual output goes a long way toward settling this problem in a time when the employment situation made it difficult to employ extras in any event.

In essence, the plan means that a man agrees to work more hours per week in the heavy traffic months, or on the heavy traffic days; and in exchange therefor he enjoys a shorter working period at other times. The natural tendency resulting from this practice is to give the experienced man the opportunity to earn extra money when there is extra work to be done, and, on the other hand, to permit the management to economize in labor expense during periods when it would not pay to have the men average a legal day's work.

It may be worth some thought to see whether this Paris plan could be put in practice here. It certainly is not fair to have to keep regular runs going full time on the dullest days simply to give the men their guaranteed pay and then, at other times, to have to employ extras with minimum wage guarantee and maximum accident liability. The annual output plan has the advantage of averaging out many inequalities and of proving profitable to both parties.

Make Your Headways Sell Your Service

"EVERY hour on the hour. Your watch is your time-table" is the well-known slogan by which some interurban railways seek to popularize their service. There is an idea in this that street railways might use, too. Of course, an hourly headway is likely to occur only in interurban service, but the same general principle applies with equal force to any other headway except one so short that the public does not have to keep in mind the leaving times of cars.

When the service is infrequent, it should be so operated that railway patrons or the man on the street can easily remember the schedule. For instance, if cars leave a central terminal on a ten-minute headway it is desirable that they should leave at ten, twenty, thirty minutes, etc., past the hour. At other points the leaving times can be remembered quite readily as the cars will leave, say, three minutes later, at thirteen, twenty-three, thirty-three, etc., or some corresponding combination. Freak headways of any sort are undesirable. One car every twenty-eight minutes is not appreciably more convenient from the standpoint of frequency than one car every half hour, and it certainly is much worse from the standpoint of ease in remembering the schedule. A combination headway with a three-minute interval between cars and then a seven-minute interval may pass for a five-minute average headway in the time-table department, but it will not be so considered by the general public.

Undoubtedly great economies in electric railway operation have been accomplished by the scientific scheduling of cars. Careful study by competent men is required to prepare time-tables so that cars will not pull out too early, stay out too long, waste time in excessive layovers, or bunch in the central district. The time and money employed to make accurate traffic checks are well spent.

But after the mathematical analysis of traffic demands has been made, the matter should not be dropped there. The psychological effect on the public of a change in the headway should be very carefully considered. For example, if a fifteen-minute headway were found slightly shorter than required by traffic demand, the interval should not be lengthened to, say, seventeen minutes. Of course, it sounds absurd to say that any railway would do such a thing as that, even though a car could be saved by the change. The JOURNAL is, however, familiar with a number of systems where just such headways are maintained, and the time-table men feel that they have made excellent schedules. In such a case as that cited, if the headway could be increased to twenty minutes it would accomplish still more saving and make a schedule the public could understand. Every unnecessary car-mile should be cut out of the schedule, of course, but there always must be a certain leeway. Since the idea of the railway is to sell service, economizing should not be done at too great a sacrifice of public convenience. The public needs to be encouraged in every possible way to ride on the railway, and an easily remembered time-table is a factor of no small importance.

Local Citizens in the Directorate an Asset for Syndicate Properties

ABSENTEE management of utilities, particularly of street railways, has long been known to have very distinct disadvantages from the standpoint of public relations. The administrative advantages of syndicate management, which are of course the reason for it, can easily be demonstrated. With the form of organization so often adopted, where the local manager has little authority and has to obtain orders from headquarters even for inconsequential acts, his position is difficult. When a serious local controversy arises some of the local people seem to take delight in attacking the company, because they feel, perhaps, that they are fighting "Wall Street"—because there is no local personality that stands out as representing the company.

Several means have been used successfully by holding companies to overcome this tendency. One of them is to place on the board of directors local men who have the confidence of the public and whose business experience qualifies them to serve. Another plan goes even further, in selecting for the president of the company a local man. The manager, of course, should be a man who, although he may come from outside and be chosen for his ability in operation, will become a part and parcel of the community.

But such things are not always done, even at this advanced stage of the art of maintaining good public relations, desirable as they are. Recently, in an instance where the company needed all the favor it could muster with the local people, the question arose at once, "Who are your local directors?"

The company had none. There was no local banker or merchant or manufacturer, whose standing in the community and whose knowledge of the company's affairs enabled him to speak authoritatively and show the justice of the company's position. There was no local man identified with the management, or who had interests in the company, that would be hurt by unfriendly or unwarranted treatment. The situation, already bad, was made that much harder to handle, and the result was perhaps less favorable than it might otherwise have been. It served to impress on observers again the desirability, in fact the necessity, of having local representation in the councils of the company.

The Habit of Preserving Junk

SOME railway men, it seems, cannot bring themselves to junk old cars as long as there is a dollar of value left in them. When the need for some change is realized, instead of buying new cars, they scheme up some way to rearrange the body, or put two bodies together, and then after a nice paint and varnish job, run the product out on the street as "modern" equipment. And what have they done?

They have increased the original investment in the car by perhaps 100 per cent, considering the price of the car twenty years ago. They have saddled upon themselves the continuance of the high energy and maintenance costs. They have continued the slow acceleration and slow running speed, items which are most costly in the light of present-day wages. They are depriving themselves of the merchandising value of the higher speed and easier riding which would have been effected by the purchase of new cars. And finally, they still have old cars—improved to be sure, but still old.

What may seem at first thought to be an economy, often is a very dear procedure. To spend 20 per cent to 30 per cent of the cost of new cars to rebuild the old ones may cause a company to lose savings which would make a substantial addition to its net, not to try to evaluate the attraction of new cars to riders.

Definite examples of this fallacy have been cited in these columns heretofore. Two more cases, which, incidentally, are from the studies of one who would not profit by the purchase of new equipment, are cited here.

A certain street railway company, had it junked its equipment and bought all new cars, instead of rebuilding, would have saved enough on the two items of power and maintenance alone to have paid for the new cars in five years and thereafter earned 20 per cent on the cost of the new cars. Still this company has not only been rebuilding its old junk, but it has bought a number of cars "unloaded" by some other company and spent a sizable amount in fitting them up.

A certain rapid transit company is planning to spend a large sum in rebuilding old wooden cars for a different manner of operation, while if it were to spend a larger amount for new cars and junk the old ones, the procedure would be twice as profitable to the company, measured in net results.

There are of course exceptions where it may actually be profitable to rebuild old cars. But generally speaking the order of the day is new cars, for it is part of the industry's program of modernization. Furthermore, it is very questionable whether any steps should be taken to perpetuate the operation of wooden cars, in view of the lightness with which steel cars can be built and their greater freedom from serious accidents.

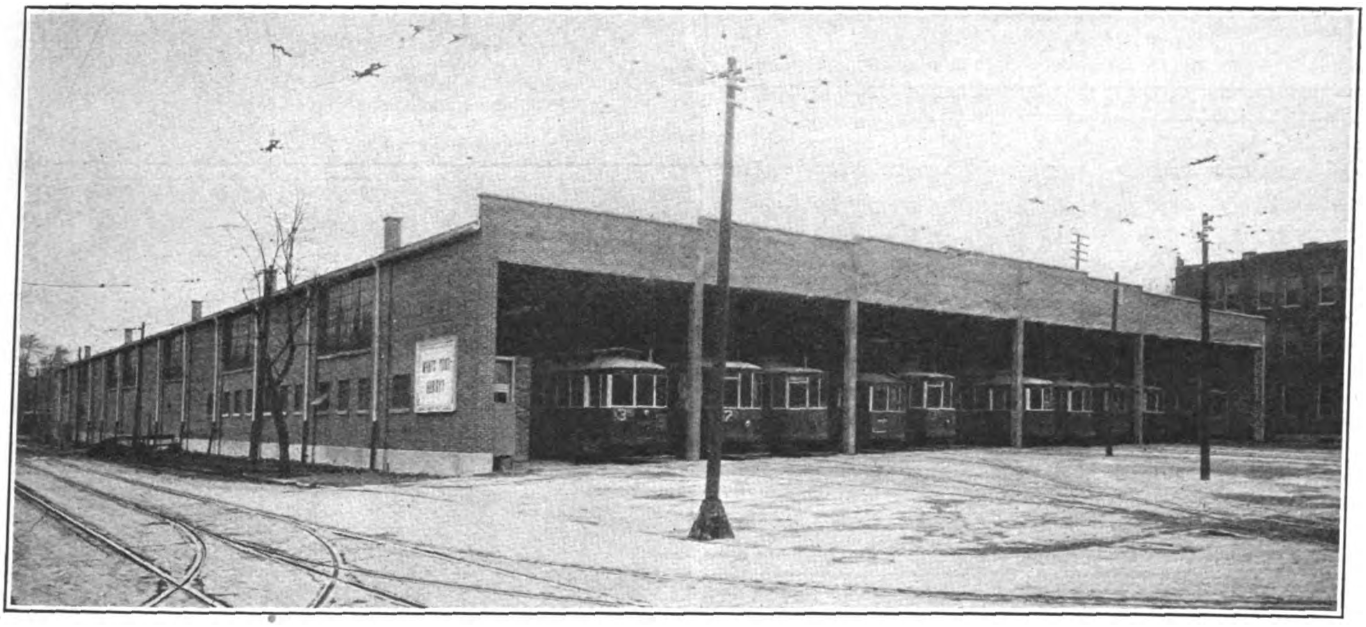
Truth Must Dominate Publicity

THERE is just a little evidence, only recently manifested, that the instrumentality of publicity may be used to put something over that would not bear up under close scrutiny. The industry should jealously watch and guard against any such work, for it will later react to undo much of the good will that has been built. We must not permit anything but honest purpose to be the underlying motive for any of our publicity matter. And we cannot afford to let any unscrupulous person endanger the accepted sincerity of our publicity efforts in general.

Carhouse for 100 Cars at Louisville

New Structure, Which Replaces Carhouse Burned Last Year, Is of Reinforced Concrete with Full Sprinkler Equipment—Through Tracks Facilitate Car Movement—A Novel Type of Double Skeleton Pits and Facilities for Car Washing Are Features

By F. H. Miller
Vice-President in Charge of Engineering, Louisville Railway



Louisville Carhouse from the Corner of Fourth and Avery Streets. A Reinforced Concrete Roof Is Placed Over the Entire Carhouse, but End Doors Are Not Provided

THE Fourth Street carhouse of the Louisville Railway, which recently was put in commission, represents the best thought of the company in the design of a modern fireproof structure for housing approximately 100 cars. Facilities are provided for inspection, car washing and light repair work.

The fire which destroyed a portion of the old carhouse occurred Jan. 15, 1923, and burned thirty-four cars of various types, including twenty-four passenger cars. The fire wall between the brick portion of the old carhouse and frame sheds, combined with a favorable direction of the wind, prevented the spread of the fire, so that no cars were lost other than those housed in the brick portion.

Four days after the fire the fire loss had been adjusted by the insurance company, the burned carhouse had been cleared of rubbish, temporary trolley wires had been erected and a temporary roof had been built over the office, so that the carhouse foreman was back in his old location and the carhouse in use. Deciding at once to rebuild, plans were prepared for the construction of a modern reinforced concrete, sprinkled carhouse, with a separate office and recreation building, the latter being placed on a separate lot owned by the company on the opposite side of Fourth Street. A contract was let for the building March 24, 1923, and the entire construction was finished in October, the office building being opened by a dance given by the Co-operative Welfare Association of the company on the night of Nov. 1.

The south end of the carhouse with its track connections was finished first and that portion placed in use while the north half was being constructed. To take care of the additional car storage required, temporary outdoor tracks were provided on company property several blocks from the carhouse site.

TRACK LAYOUT IS FLEXIBLE

The new track layout is very flexible, as indicated in the larger line drawing. The loop around the office building is used as a terminus for a short line of cars. Cars can enter the house from either direction and, as each track goes completely through, can leave without being reversed. It is also possible to wye cars at either end of the carhouse. This arrangement is of particular advantage when hauling trailers, as is the practice in Louisville.

Due to the narrowness of the street and the special track layout, the ends of the building are set back 45 ft. 9½ in. from the property line. This gives ample clearance within the house.

The construction is reinforced concrete throughout, except the walls, which are of brick. No doors have been placed at either end of the carhouse, but provision has been made for installing gates in case they are deemed necessary. This has been provided for by inserting steel angle supports for hinges in the vertical concrete columns. Some saving was made by utilizing the east wall of the old brick carhouse in the construction.

A row of small rooms and bins has been built along the entire west wall of the carhouse. These provide a shop office, a room for the motor inspectors, wash-

Some Views of the Louisville Carhouse and Headquarters Building

No. 1. The office building is directly across the street from the carhouse.

No. 2. The double pit has a concrete walkway in the center between tracks, with open space beneath.

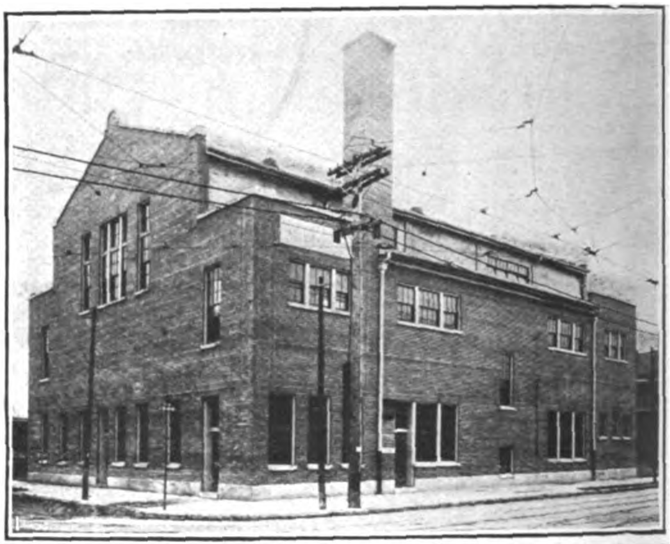
No. 3. The sprinkler system is directly beneath the roof and the trolleys are carried in wooden troughs.

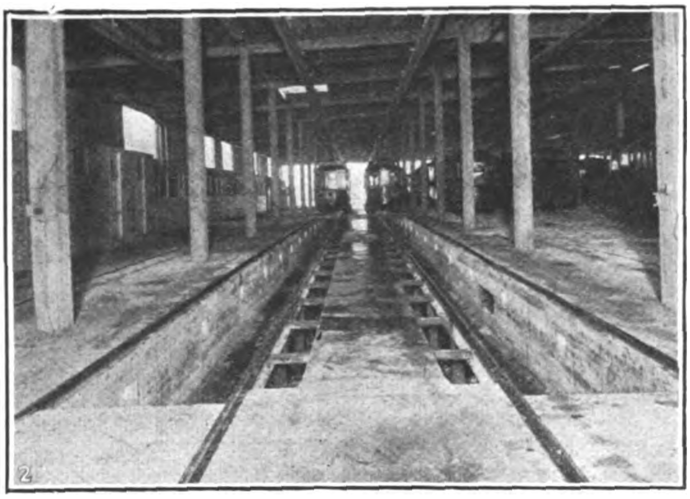
No. 4. The foreman's office is light and cheerful.

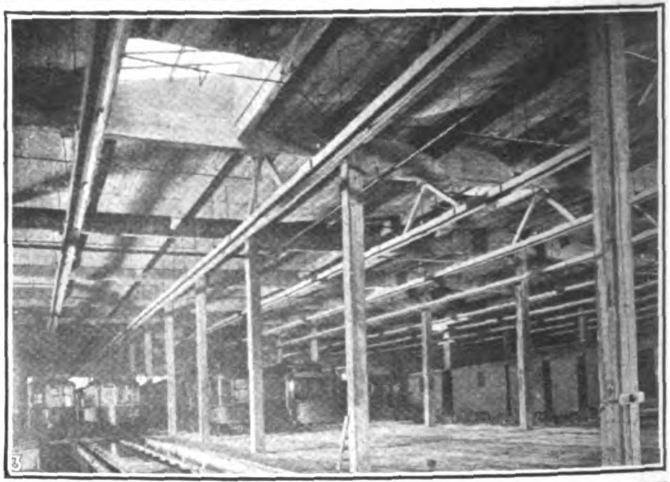
No. 5. The reporting room for the platform men.

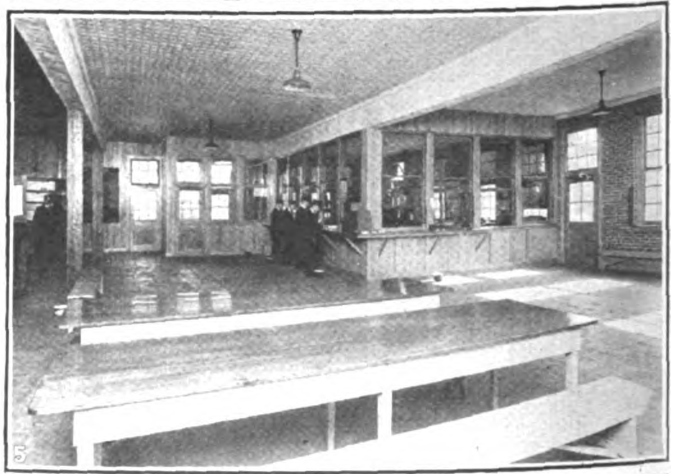
No. 6. Pool tables are provided in the recreation room for trainmen.

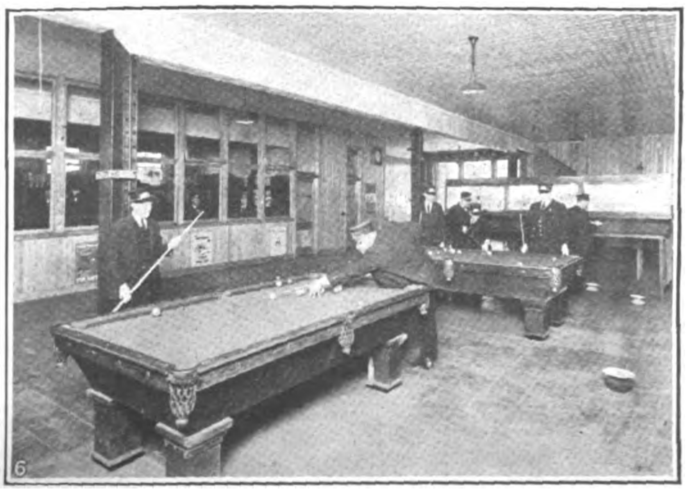
No. 7. The second floor provides a basketball court and assembly room.











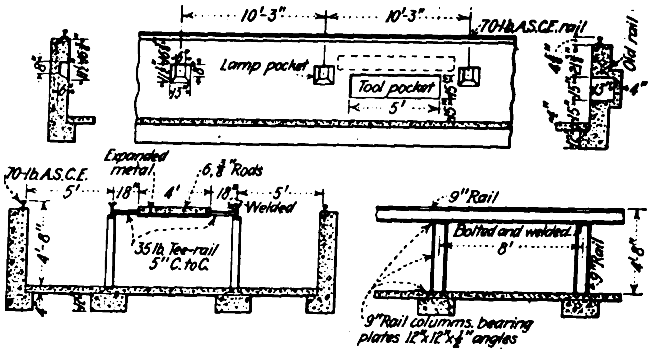
rooms and toilets for men employees and women car washers, also for storage of various kinds. Space is given for drying and storing sand, coke and salt. Steel sash are used in the windows.

The roof is of reinforced concrete construction, supported on reinforced concrete pillars spaced between the tracks. The roof is covered with 4-ply Trinidad Lake asphalt felt. A number of skylights in the roof provide light and ventilation.

Fire protection for the entire building is obtained by the dry-pipe sprinkler system. There are 1,486 sprinkler heads spaced beneath the roof, instead of at car height. This places them out of danger of being struck by trolley poles. Sprinkler heads are not provided in the pits.

The arrangements within the carhouse are shown in the larger line drawing. There is one pit of ordinary type, 150 ft. long, on track 8. Two double pits of novel construction are under tracks 2 and 3 and 10 and 11. These pits, shown in the accompanying illustrations, are arranged in such a manner as to give a free space on one side of each of the two adjoining tracks. This is accomplished by supporting the track rails on vertical columns made of old 9-in. girder rails. Cross members of 35-lb. T-rail tie the adjacent track rails together and form the beams for a reinforced concrete walkway midway between the two tracks of the pair. The steel members are bolted and welded top and bottom. The pits are 4 ft. 8 in. deep from the top of the track rails, which leaves a free space beneath the concrete walkway of approximately 3 ft. 10 in.

In addition to lamp pockets along the walls of the pits, a novel feature is the inclusion of tool pockets, providing places where the workman may leave his tools out of the dirt and moisture of the pit bottom. There are four of these pockets, two on each side of a double pit, the nearest one being approximately 20 ft. from the steps at the end. The lamp pockets are spaced 10 ft. 2 in., giving ample lighting at all points beneath the cars.

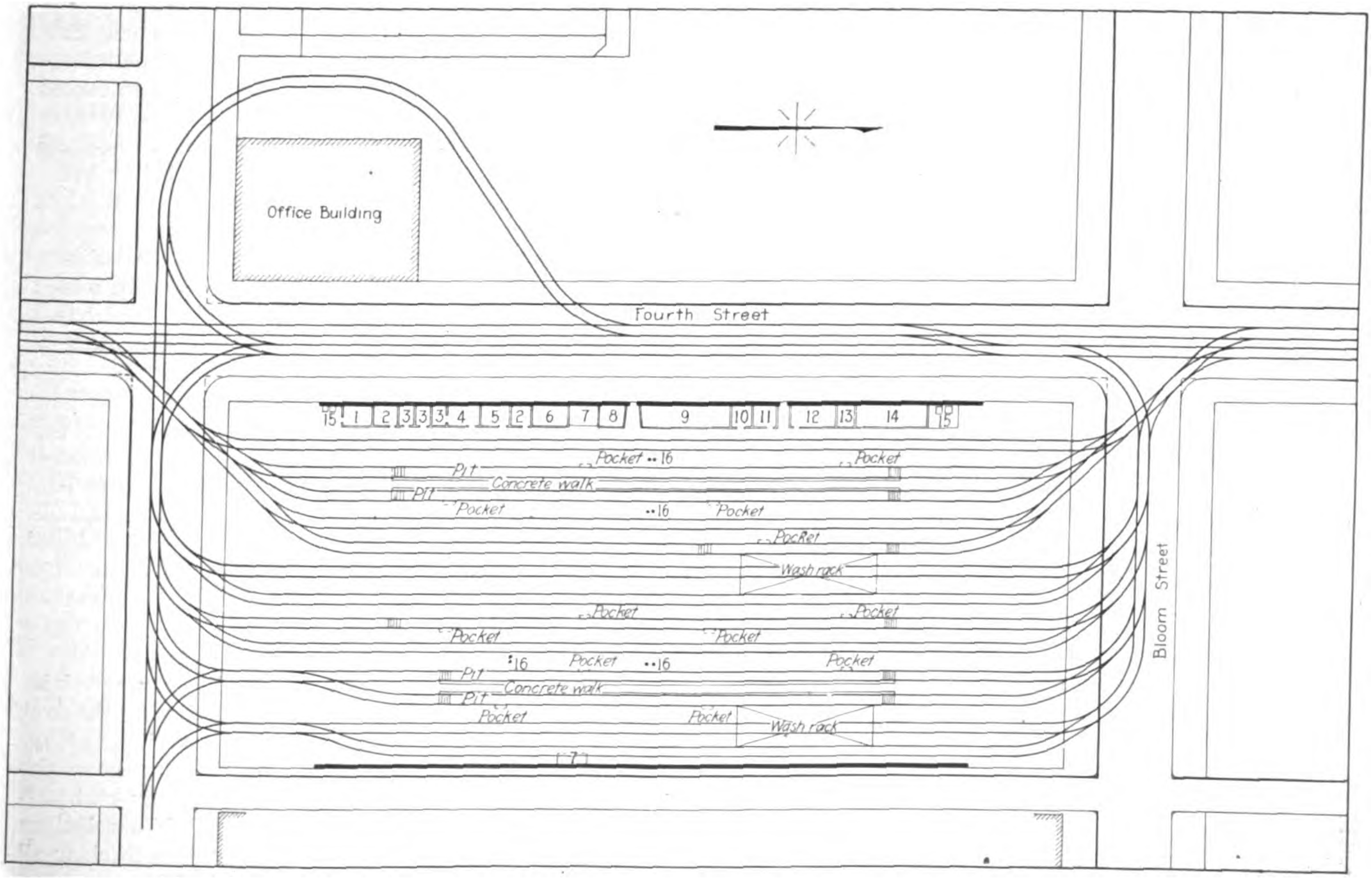

10'-3"
10'-3"
70-lb.A.S.C.E. rail
Old rail
Lamp pocket
Tool pocket
5'
4'-8"
4"
Expanded metal
70-lb.A.S.C.E.
6, 3/8" Rods
5'
18"
4'
18"
5'
Welded
4'-8"
35 lb. Tee-rail 5" C. to C.
9" Rail
Bolted and welded
8'
9" Rail
4'-8"
9" Rail columns, bearing plates 12"x12"x1/2" angles

Details of Pits, Showing Walkway Construction

The floor of the carhouse is paved with 1½ in. of Tarmac placed on old macadam ballast which had previously been thoroughly tamped and rolled. Relaying rails are placed on creosoted ties for the trackwork inside the carhouse. Inside drainage is provided by frequent cesspools connected to 8-in. wrought iron drain pipes which connect with the city sewers.

The carhouse is piped for both hot and cold water, and a number of taps for each are provided at convenient points.

A car washing system is being installed at two locations within the carhouse. With this arrangement,


Office Building
Fourth Street
Bloom Street
15
1
2
3
3
3
4
5
2
6
7
8
9
10
11
12
13
14
15
Pit
Pit
Concrete walk
Pocket
16
Wash rack
7

Floor Plan of New Louisville Carhouse

1—Office.
2—Storage.
3—Toilets.
4—For women car washers.
5—For men car washers.
6—Salt.
7—Pit and sprinkler system control.
8—Kindling.
9—Sand.
10—Rags.
11—Oil.
12—Motor inspector's room.
13—Coal.
14—Coke.
15—Sand and coke.

cars will be washed by being passed between several vertical streams of flowing water. This system is similar to that used successfully in Detroit and Toronto.

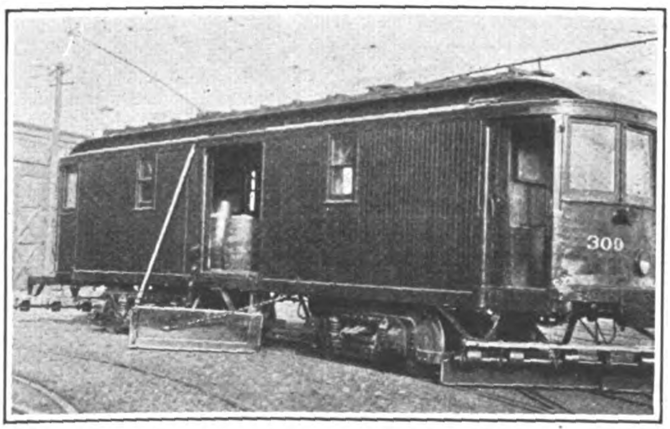
Wooden trolley troughs are used throughout the carhouse, being suspended from the concrete roof by means of $\frac{3}{4}$-in. rods. Lighting within the carhouse is from the 600-volt d.c. trolley circuit, while the office building across the street is lighted from the local electric light company's service.

The office building, which is directly across Fourth Street from the carhouse, at the corner of Avery Street, has the foreman's office on the first floor. A large waiting and recreation room is provided for the platform men. As shown in the illustrations, this room contains ample facilities for writing reports, and is provided with time-table racks, bulletin boards, etc. There are also two pool tables, a locker room with individual steel lockers for each employee, a shower bath room with extra lockers for the basketball teams and a washroom. The second story is devoted to recreation purposes and has a large floor which is used for games and as a gymnasium. The basketball floor is 40 ft. x 80 ft. with a clear height of 25 ft. This floor is used weekly by the company basketball team, which plays in an industrial league. The employees also hold dances there monthly.

The basement, which goes under only a portion of the building, provides space for a heating plant and coal storage.

Snow Scrapers on Heavy Freight Car

BECAUSE of lack of business due to auto truck competition, the electric express department of the Union Street Railway, New Bedford, Mass., was forced to discontinue operation some time ago. This left the company with several express cars on its hands and no apparent use for them. As they were of heavy tonnage the company decided to try the experiment of equipping them with special snow-fighting apparatus. This was done in different ways on different cars, but the general plan was to place diagonal scrapers on the front and rear ends and wing attachments at the middle of the sides. A typical example of such a freight car equipped for snow-fighting work is shown in the accompanying illustration. These cars have proved extremely effective.

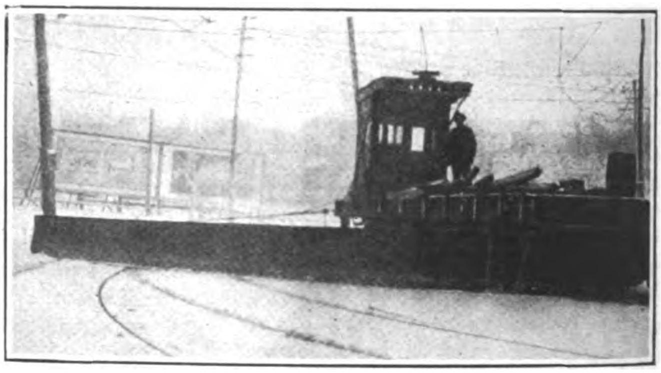


One of Several Express Cars Rebuilt by the Union Street Railway for Use as Snow Plows

Close supervision over the operation of snow plows during a storm is accomplished by means of a large map showing all the routes of the railway. Yellow headed pins numbered to correspond with the numbers of the snow plows are placed on this map to indicate the position of the different units. The operators of plows are required to telephone in to the office of the superintendent of transportation whenever they reach a telephone station. The approximate location of every such unit at any particular moment is shown by the pins on the map.

Long Wing Clears Roadway of Snow

AFTER a snowstorm, in order to clear a vehicular roadway alongside of its track and thus provide a place for the operation of automobiles, the Boston & Worcester Street Railway, Framingham, Mass., has equipped a heavy flat car with two extremely long wings. There is a wing on each side of the car arranged to swing outward to the right from the front end of the car, regardless of the direction in which it is going. The wings are hinged and may be swung outward at varying angles according to the width of the roadway to be cleared of snow. When not in use they are swung in close to the side of the car and hooked up.



When the Snow Wing on This Car Is Swung Outward to the Maximum a Roadway of 22 Ft. Can Be Cleared

Each wing is built of $\frac{5}{8}$-in. steel sheeting reinforced in back by two 75-lb. rails. Two A-frames, the vertices of which rest in sockets in the side of the car and the legs of which rest against the wings, are used to brace it in its outward position. Frames of different sizes are available so that the position of the wing may be adjusted. Timber is used for these frames, the dimensions depending upon the length and the strain which they have to carry. The wing is 33 ft. long and has a maximum sweep of 22 ft. A minimum space of 4 ft. can be obtained by using the shortest frame.

Because it is of such heavy construction this long wing is difficult to handle. The procedure when it is desired to swing it out into position is first to raise it slightly by means of a block and fall from the supports on which it normally rests. It is then pushed out by hand far enough to clear the supports and dropped down to the ground. The car is backed up and the wing swings out by itself. The two A-frames are then placed in their proper position, after which the wing is tightened up by means of ropes and pulleys.

It is thought by the railway that this car saved its comparatively small cost of construction during the first snowstorm. The clearing of a vehicular railway alongside of the track has made it possible to keep the automobiles and motor trucks off the railway right-of-way and has prevented many tieups. Public relations also have been improved. It is the practice to clear all streets where the railway operates with this apparatus, the snow being pushed back all the way to the curb. No particular attention is paid to sidewalks, hydrants, etc., in the operation of the car, the clearing of such locations being done later by hand.

Would Speed Up Cars and Stop Jitneys

In Houston, Tex., Shortening of Indirect Railway Routes, the Elimination of Unnecessary Stops and Changes in Car Design to Speed Up Service Are Recommended as the Result of Consultant's Investigation —Jitneys Unnecessary and Elimination Will Materially Aid Railway

ELIMINATION of jitneys on the part of the city, and rerouting, rescheduling and general conservation of time, combined with the use of all practicable operating economies on the part of the Houston Electric Company, are recommended in two reports by John A. Beeler, New York, made for the city. He maintains that the jitney should be limited to fields where it will assist in building up the community rather than to be allowed to operate where it tends to destroy a service which it is economically unfitted to supplant. While showing the city the wisdom of eliminating this unfair competition, the report points out that the solution of present difficulties lies largely within the power of the railway. It must revamp its slow, halting service, eliminate unnecessary stops and delays, and reduce the waste in all factors involving the time element.

As a result of this survey an agreement has been accepted by the city and by the company, as told in ELECTRIC RAILWAY JOURNAL of Jan. 26, 1924, which will eliminate the jitneys after April 1. The railway will undertake extensive improvements costing approximately $1,500,000 during the next three years.

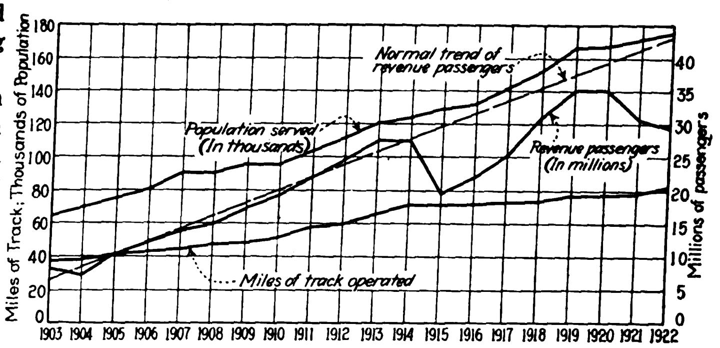
The engineer's report shows that the number of revenue rides per capita per annum per mile of track formerly ran between 3.36 and 3.91, averaging 3.58 prior to 1914. In 1915 when the jitneys began to operate in numbers this factor dropped to 2.13. Since then the riding habit has been unsteady. It rose to 2.78 in 1918, but afterward it fell off steadily until 1922, when it was down to 2.08, or 40 per cent below the pre-war rate. There has been a similar trend in the total number of revenue passengers carried. Had the general traffic trend continued after 1914 as it was from 1903 to 1914, the number of passengers would now be 45,000,000 instead of 31,000,000. The jitney in 1923 was carrying 8,700,000 passengers, bringing up the total to nearly 40,000,000. The fare increase to 7 cents undoubtedly had its effect on the riding habit, but the slow speed of cars is thought to be also to blame.

Factors that are contributing to slow speed in Houston are slow loading and unloading due to narrow single doors, waiting at turnouts, too many stopping places, and a large number of positive stops, the report states. The failure on the part of the management and the men to realize the value of the time element in transportation is everywhere in evidence. The value of a second seems to be completely ignored. These valuable time units are being squandered all day long on practically all lines. One of the reasons why the jitney has made such inroads into the railway business is because it saves time.

The operating revenues for Houston are uniformly lower than elsewhere except as measured in earnings per mile of track. The reason for this item being higher is apparently the large amount of single track. This would indicate the need of more double-track lines for two-way operation, enabling the company to make better schedule speed.

At present there are nineteen routes in operation. Four of these are shuttle lines. Six are routes operating through the business district from one section of the city to another. The through routing is a prominent feature. Favorable conditions for through routes require balanced loading in the two sections and direct-routing. Some of the present lines do not entirely meet these requirements, and suggestions are made in the report for rerouting to overcome this difficulty.

A number of lines operate in one direction only on certain streets, service in the other direction being supplied on a parallel street several blocks away. On one single-track belt line the patrons from some districts ride a considerable distance out of their way on inbound trips. Test rides show that approximately 73 per cent of the total passengers ride through the terminal on their way to the business district. These people are carried on an average of 1.19 miles out of their way at a loss of eight minutes time.

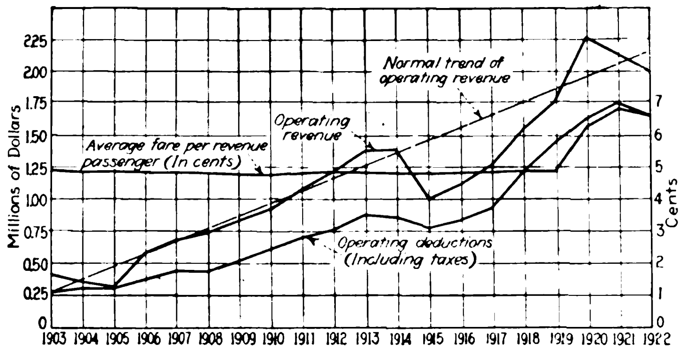


Population Served, Track Operated, and Revenue Passengers of the Houston Electric Company, 1903 to 1922. Passenger Curve Shows Effect of Jitneys, Beginning in 1915.

A routing which will provide an extension of service into some well-settled districts, and give two-way service in some sections now served in only one direction by the present belt or loop lines, would be an improvement over the existing arrangement. The principal changes suggested to accomplish this end are the combination of two shuttle lines with their connecting trunk lines, and the double tracking of certain streets to permit operation in both directions.

The discontinuance and removal of 2.32 miles of track is recommended. This is to be replaced by 3.66 miles of new track consisting of connections for more direct routing, and double tracking for some of the existing single-track lines. The track which is to be removed includes single track which must be taken up for the laying of double track. As much of this track is rapidly approaching a condition when it will have to be rebuilt, the entire expense can hardly be attributed to rerouting alone. The extent of the accrued depreciation would be a renewal. It is considered that it would be advisable to charge the value of all the track that is discontinued to the renewal and retirement fund instead of new capital account.

The running time of a street car is of vital importance to the quality of service. The faster the schedules are, consistent with their being maintained, the



Average Fare per Revenue Passenger, and Annual Revenue and Expenses, Houston Electric Company

better the service for the car rider and the community in general. Cars are averaging 9 m.p.h., while the jitneys are making 14 m.p.h. Every practicable thing should be done to minimize the delays and speed up the service. The running time on most of the lines in Houston is too slow. Some have a long layover, much of which is killed along the route to the disgust of the patron.

Cars are operated at present on a "stop-at-every-block" policy. The number of passenger stopping places under the arrangement is about sixteen to the mile. In Houston an average of 6.28 stops per mile are made during the middle of the day, and 6.83 per mile during the rush hour.

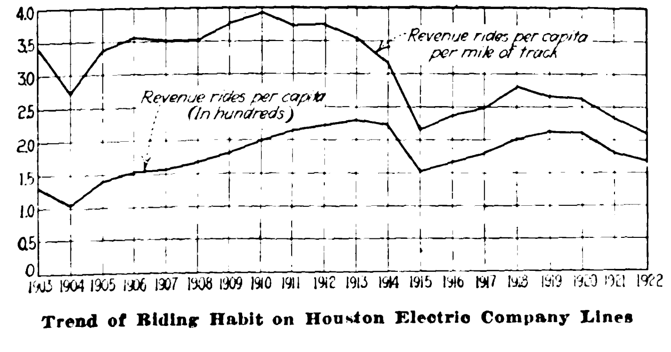
The report states that a complete revision of stopping places is hardly justified, but that readjustment is needed in some sections where the spacing is altogether too close. Care should be taken to have the stops located in the most advantageous places. A stop should not be made on a single track if there is a possibility of one on double track serving approximately the same location. By this means cars moving in the opposite direction would not be delayed.

At certain points positive stops serve a useful purpose. It is common practice, however, to have positive stops ordered for various reasons which have little or nothing to do with safety, and sometimes they are enforced long after the disappearance of conditions for which they were installed. Houston has an excessive number of positive stops.

Boulevards are important arteries of passenger travel, but the number of persons in automobiles accommodated by requiring every street car to stop before crossing is small compared with the number of car patrons discommoded by the practice.

Positive stops are made at street car intersections by cars approaching on all lines. This is unnecessary as the more important lines can be given the preference and the other lines required to observe the stop. Such a procedure would speed up considerably more than half the cars, with no reduction in safety.

At all street intersections in the business district positive stops are required. This applies even when the signal lights show "clear." While it is true that a car is usually obliged to stop at each of these intersections to load or unload passengers, this does not entirely justify the practice, because it is the occasional time gained when having the right-of-way that enables the cars to keep on schedule.



Trend of Riding Habit on Houston Electric Company Lines

Double berthing should be employed at all important stops in the congested districts and at the heavier outside loading points. This is not now practiced, although when two or three cars are standing at the same stopping place they all load and unload simultaneously. However, when the first car pulls out the second car frequently goes forward and stops again for additional passengers. When the second car moves ahead after taking on and discharging passengers it should proceed without stopping a second time.

Every one-man safety car in Houston is provided with a single door at the front end. Only one line of passengers can load or unload at a time. It is not uncommon during the rush hour to see a car stand ninety seconds or longer at a single stop. In the business district where the congestion is greatest and where there is the greatest necessity of keeping cars in motion, the most time is taken up in the interchange of passengers. Every possible means should be used to reduce the length of stop. Test rides indicate that the average length of passenger stop is slightly more than eleven seconds. With a car making six stops per mile it means that with every second reduction in the average length of stop, the speed can be increased one-eighth of a mile per hour.

All of the large double-truck Birney cars should be remodeled so as to provide separate entrance and exit facilities at the front end, and a single entrance or exit at the rear. With such an arrangement and with the use of street collectors, loading and unloading in many instances would be accomplished in a third of the time that it takes at present.

At the more congested corners, young, energetic men should be stationed to sell tickets, collect fares, and assist passengers. With the larger cars remodeled and equipped with doors at both ends, these street collectors can let passengers in the rear door in the case of the safety car, or in the front door on the two-man car.

One source of delay to street cars and vehicles alike is angle parking in the congested district. In many places this forces moving vehicles on the car tracks and interferes seriously with the movement of all traffic. The parked cars backing out into the street are a source of great danger. For safety and speed in transportation, angle parking should be discontinued on all streets on which there are car movements. Of course, parking opposite a car stop should be prohibited throughout the city.

The effect of the proposed changes in routing and headways will reduce the number of cars needed.

NUMBER OF CARS

	Present	Proposed
A. M. rush period	158	147
Non-rush period	90	83
P. M. rush period	174	152
Night	73	68

The proposed schedules result in a total saving of seven base and twenty-two rush-hour cars, and the proportion of one-man cars is greatly increased. About 27 per cent of the cars are now operated with two men. Careful investigation indicates that one-man operation can be extended further, thus increasing the efficiency

With a single exception, all lines should operate one-man cars regularly.

A summary of the car-hours and car-miles present and proposed follows:

	Car-Miles		Car-Hours	
	Present	Proposed	Present	Proposed
Two-man cars	3,984	1,300	464	155
One-man cars (single-truck)	8,709	8,587	1,030	935
One-man cars (double-truck)	5,349	7,720	540	762
All cars	18,042	17,607	2,034	1,852

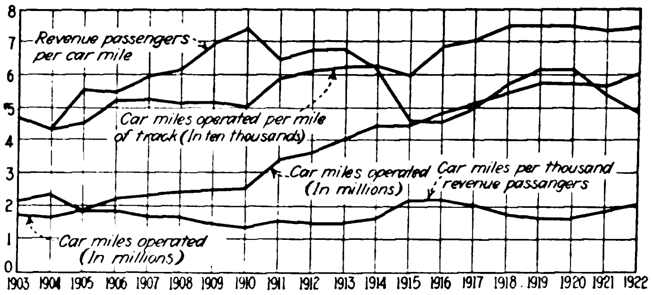
This is a saving in car-hours required of 182 daily, and 309 car-hours now operated with two-man cars will be replaced by one-man cars. There will be a reduction of 435 car-miles daily because of the better distribution of service. There will be an actual extension and increase of needed service. The waste mileage will be eliminated, several of the routes will be shortened, two-way service will be provided in a number of places where there is only one-way operation at present, and the rush-hour cars will be better distributed to meet the demands under the proposed plan.

More than 33 per cent of the revenue passengers carried by the Houston Electric Company make use of the free transfer privilege. Such a proportion is unusually large for a system with so many through lines, and one with practically every line entering the business district. Many people do not hesitate to use transfers improperly obtained or that have expired. The railway is thought to be largely to blame for the abuse of the transfer privilege because of the laxity of the system employed. It is recommended that a new type transfer be adopted and that the issuance and acceptance of transfers be carefully inspected.

FINANCIAL ASPECTS OF RECOMMENDATIONS

The consultant states in his report that in order to bring the plant up to the highest degree of operating efficiency needed, some $163,000 will have to be spent for trackwork, and fifteen modern double-truck one-man cars purchased at a cost of about $12,000 each or a total of $180,000. This means a total immediate expenditure of $343,000.

As all of the new cars are replacing old equipment unfitted for present operation, their entire cost should be paid out of the renewals and retirements reserve. The cost represented by the track that is retired by the new trackwork should be charged to the renewals and retirements reserve. This amounts to $93,000, leaving about $70,000 which should be charged to capital. At 7 per cent this will increase the annual interest charges $4,900.



Service Rendered by Houston Electric Company. Total Car-Miles Operated, Car-Miles per Mile of Track and per Thousand Revenue Passengers, and Revenue Passengers per Car-Mile

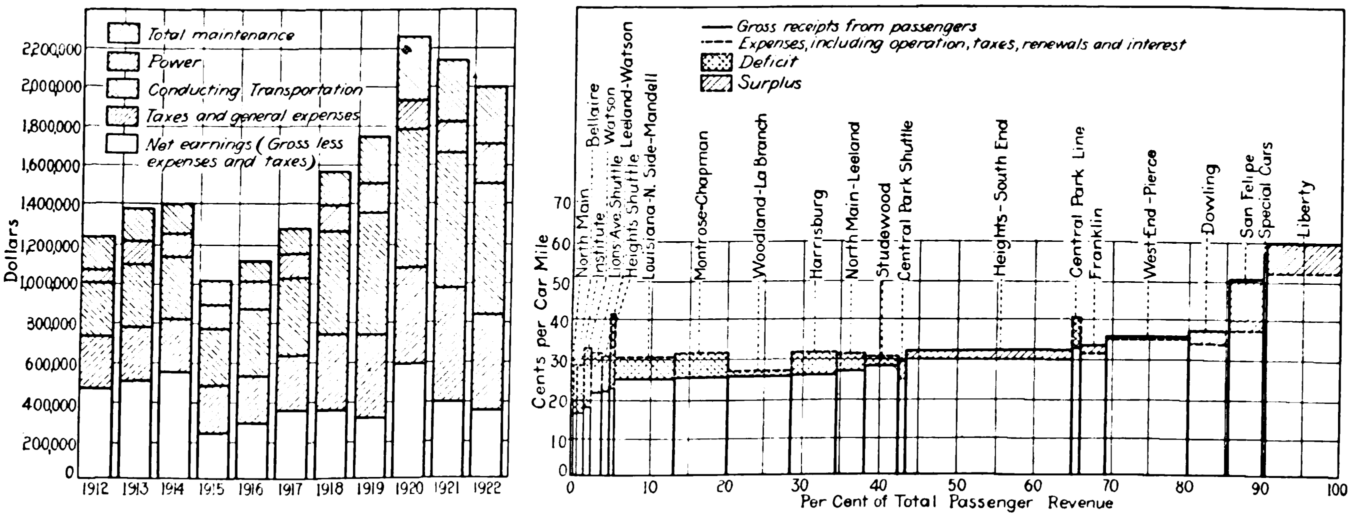
In order to determine the reduction in operating expense due to the fewer car-hours required, an estimate was prepared of the cost per car-hour. With the changes as proposed effective, the total annual reduction in expenses that should accrue are as follows:

309 car-hours daily changed from two-man to one-man operation, 309 x $0.741, equals $229 daily; or yearly, $229 x 365	$83,500
95 one-man single-truck car-hours saved daily, 95 x $1.277, equals $121 daily, or yearly, $121 x 365	44,300
Equivalent of eighty-seven one-man double-truck car-hours saved daily, 87 x $1.598, equals $139 daily, or yearly, $139 x 365	50,700
Increased revenue by improved transfer system	65,000
Total savings	$243,500

Complete accounts for 1923 beyond the five months ending May 31 are not available at this time, but judging from last year's accounts, these five months may be taken as representative of what may be expected for the entire year of 1923. The total revenue will be about $2,042,000, an increase of $40,000 over last year; but operating deductions, including taxes, will increase from $1,659,000 to $1,683,000, leaving net earnings of $359,000. After interest and amortization charges of about $232,000 are paid off, a surplus of $127,000 will remain for renewals and dividends on the capital stock.

The statement below shows these figures in comparison with the estimated results with the proposed plan in operation for the year.

	Present Operations		Under Proposed Plan	
Operating revenue		$2,042,000		$2,107,000
Operating expense	$1,538,000		$1,360,000	
Taxes	145,000		145,000	
Operating deductions		$1,683,000		$1,505,000
Net earnings		$359,000		$602,000



Left—Distribution of Revenue Since 1912. Right—Receipts and Expenses per Car-Mile by Routes. This Gives a Complete Picture of the Difficult Situation Confronting the Houston Electric Company in the Face of Jitney Competition

It is also pointed out that without jitney competition, the gross revenue of the railway for 1923 would probably be about $2,250,000 instead of $2,042,000.

HOW THE JITNEY AFFECTS THE SITUATION

Jitney competition began in 1914. Its effect on the railway revenue can be seen by the drop in revenue during the later years. At the present time the city is served by a dual transportation system comprising nineteen electric car lines and eight jitney lines. The jitney lines all operate between near-by residential sections and the business district and in nearly every instance along or parallel to the railway lines. The type of jitney employed is the ordinary Ford touring car.

The investment actually represented in the make-up of the two systems is assumed by the engineer to be as follows, that for the jitney, with garage and shop facilities, being estimated at $1,000 for each vehicle in service:

INVESTMENT COMPARISON IN RAILWAY AND JITNEY

	Railway	Jitney
Investment represented	$6,000,000	$150,000
Investment per capita served	33.52	.83
Investment per dollar of annual revenue	3.00	.29
Investment per thousand revenue passengers	193.00	17.23
Investment per thousand seat-miles operated annually	23.00	5.86

The following comparative figures give a good idea of the annual volume of business handled under present conditions:

PASSENGERS CARRIED

	Railway	Jitney	Total
Revenue	31,000,000	8,710,000	39,710,000
Transfer	11,450,000	....	11,450,000
Total (including free)	42,800,000	8,710,000	51,510,000

Of the 39,710,000 revenue passengers, the jitney carries 8,710,000, or 22 per cent. Out of the grand total of 51,510,000 passengers, which includes transfer and free passengers, the jitney carries but 17 per cent, while it receives passenger revenues of $522,600, or 21 per cent of the combined revenues. The service conditions may be briefly summarized as follows:

COMPARATIVE SERVICE CONDITIONS, RAILWAY AND JITNEY

	Railway	Jitney
Active cars in daily service	174	150
Car-miles run annually	6,525,000	6,421,000
Car-hours per annum	719,800	454,913
Average passenger seats per car	40	4
Seat-miles in millions per annum	261	26
Average speed, miles per hour	9.1	14.1
Miles per day per car	103	117
Miles per annum per car	37,550	42,800
Seat-miles per revenue passenger	8	3

While the total mileage is about equally divided between jitney and railway, the latter with greater seating capacity is transporting five times as many passengers as the jitney, and is giving 261,000,000 seat-miles as against 26,000,000 for the jitney. The number of seat-miles furnished per each revenue passenger, namely, eight and three, respectively, shows that the railway is furnishing 166 per cent more transportation service than the jitneys. This is partially due to the longer haul on the railway line and partially to the greater seating capacity of the railway cars. The speed of the jitney, viz., 14.1 m.p.h., is its greatest advantage to the patron, being 55 per cent faster than the railway, resulting in an average saving of about four and one-half minutes per trip. Some idea as to the relative operating features of the two methods of transportation may be gained from the following:

OPERATING FEATURES COMPARED

	Railway	Jitney
Revenue per car-mile, in cents	30.7	8.0
Revenue per car-hour, in cents	278	115
Total passengers per car-mile	6.58	1.36
Total passengers per man-hour	60	19
Man-hours required per thousand seat-miles	2.7	17.7

The jitney, operating in uniformly well populated districts, on a short haul basis, and making better speed, is earning $1.15 per car-hour, or nearly 40 per cent as much as the railway, while the earnings on a car-mile basis are 8 cents, or slightly less than one-fourth that of the railway. The fact that the jitney requires 17.7 man-hours to render a thousand seat-miles as against 2.7 for the railway, or 550 per cent more, shows huge waste of man-power by this method.

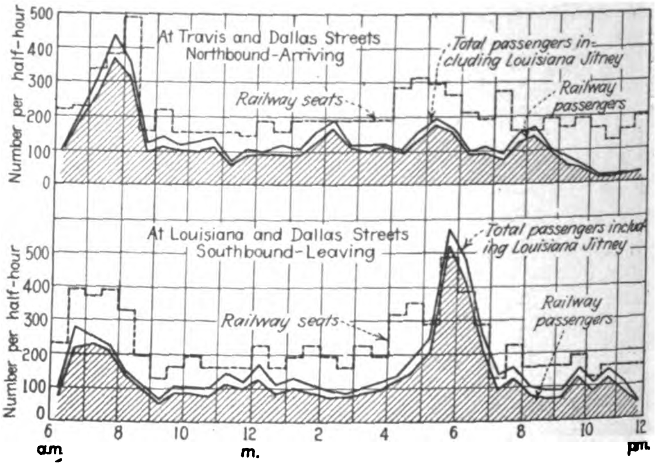
Although on some routes the jitneys run on an average of one minute apart during the rush hours, the individual is not always benefited. Often all available seats are occupied and prospective passengers are kept waiting. This type of vehicle provides only four regular seats but loads of nine or more passengers are not uncommon. The extra passengers sit upon or lean against the doors.

Passenger fares, length of trip and rides, and rates are compared below:

LENGTH OF RIDE AND RATE OF FARE

	Railway	Jitney
Cash fare, in cents	7.00	6.00
Ticket rate, in cents	6.25	....
Average receipts per revenue passenger, cents	6.45	6.00
Average length of one-way car trip, in miles	5.37	2.62
Average rate of fare per trip mile, in cents	1.20	2.30
Average length of ride per revenue passenger in miles	2.83	1.96
Averge rate of fare per mile of passenger ride in cents	2.28	3.06

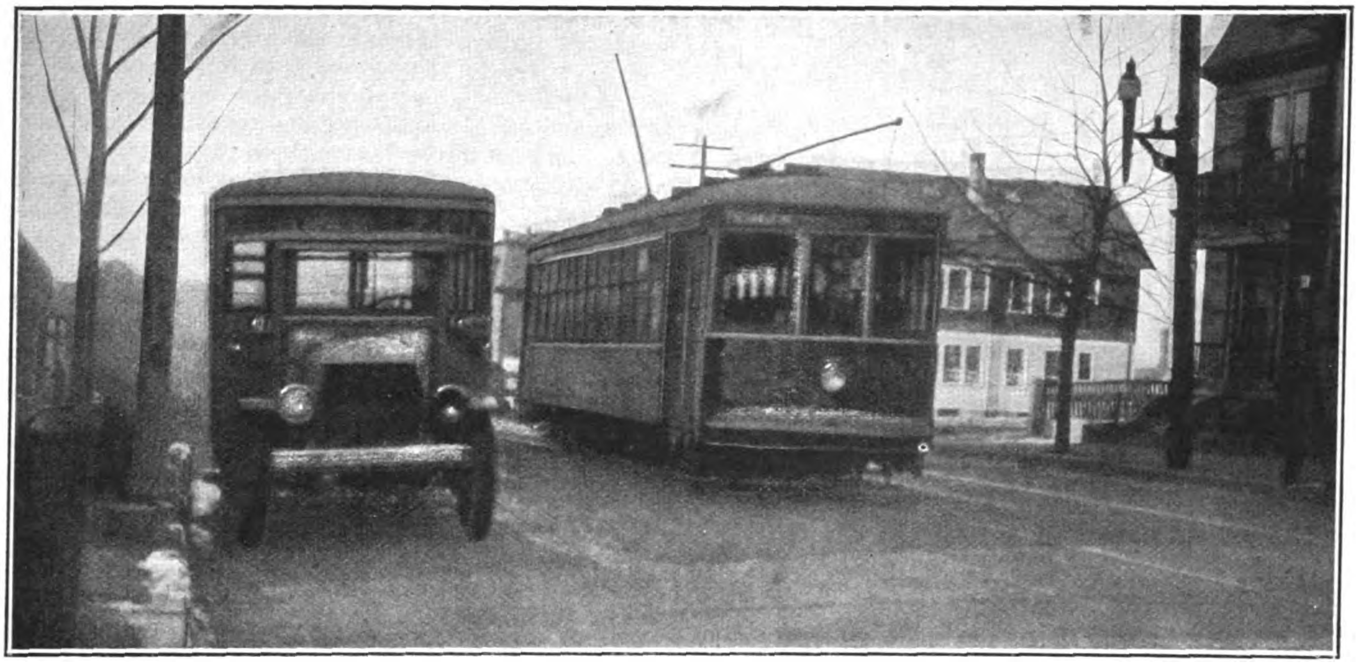
Although the cash fare on the jitney is 1 cent less than on the railway, the actual rate per mile of passenger ride is greater on the jitney. The jitney rate of 3.06 cents per mile, applied to the railway passenger on the basis of his present average length of ride, would cause him to pay 8.67 cents. On the other hand, were the railway rate of 2.28 cents per revenue passenger-mile applied to the jitney passenger, a charge of 4.47 cents would result. The jitney rate is thus seen to be 34 per cent higher than the railway rate when the average distance actually traveled by the revenue passenger is taken into consideration.



A Comparison of Railway and Jitney Seats Provided, and the Loading of Each

This is for a competitive railway and jitney line and is typical of the study made for each line. The graph shows that the railway provides enough seats to accommodate both jitney and railway passengers at nearly all hours of the day.

In conclusion the report states that jitney operation has no place in mass transportation or where congestion is acute. Jitney routes should not parallel or run along railway routes where the service furnished is adequate. Where unnecessary duplication of transit facilities or service is maintained an economical rate of fare cannot be maintained for long. To continue such a practice indefinitely will involve the community in an unnecessary and wasteful expense that must eventually be paid for by the users in some form or another.



Railway Buses and Cars Operate Side by Side on Broadway, Providence

"Four-Track" Operation in Providence

Co-ordinated Service, with Buses Carrying the Local Passengers and Cars Running Express, Has Enabled the United Electric Railways to Reduce by Five Minutes the Running Time to Olneyville Square—Joint Operation Necessitates New Methods of Snow Removel

BY THE unusual expedient of inaugurating bus service parallel to and on the same street with its regular car service, the United Electric Railways, Providence, R. I., has increased its net income and gained much public good will. For several years there was a persistent demand from the residents of suburban communities, particularly in the district beyond Olneyville, for more rapid transportation. At that time the company was operating both local service in the city and through service to the outlying communities via Broadway. The complaint was that the many stops made to care for the short-haul passengers were a source of serious delay to the through passengers. Complaint was made also that on an inbound car the local passengers had no chance whatever of securing seats, because they were all occupied by the through passengers boarding at points beyond Olneyville, before the car reached the city limits.

One way that was suggested to remedy this was to build passing tracks alongside the existing double tracks to permit the operation of express cars which could then get ahead of the locals. It was felt by the company, however, that such a solution of the problem would involve considerable expense and would present serious operating difficulties. Instead of installing passing tracks, therefore, the railway decided to carry the local passengers by bus and operate all electric cars express to Olneyville Square. A summary of the proposed plan was given in ELECTRIC RAILWAY JOURNAL for Feb. 17, 1923.

A combination of two favorable circumstances made it possible to do this successfully. In the first place, the width of the street was sufficient to permit bus operation alongside the track without interfering in any way with the rail operation. In the second place, there is only one heavy traffic street crossing Broadway, so that the express cars can operate reasonably close to their scheduled speed and are not frequently delayed by traffic at intersections. The result has been to reduce the running time between the center of Providence and Olneyville Square, about 1¾ miles, from fifteen minutes to ten minutes, and also to provide vehicles which have empty seats available for the short riders.

Twin Yellow Bands on the Trolley Poles Mark Bus Stations

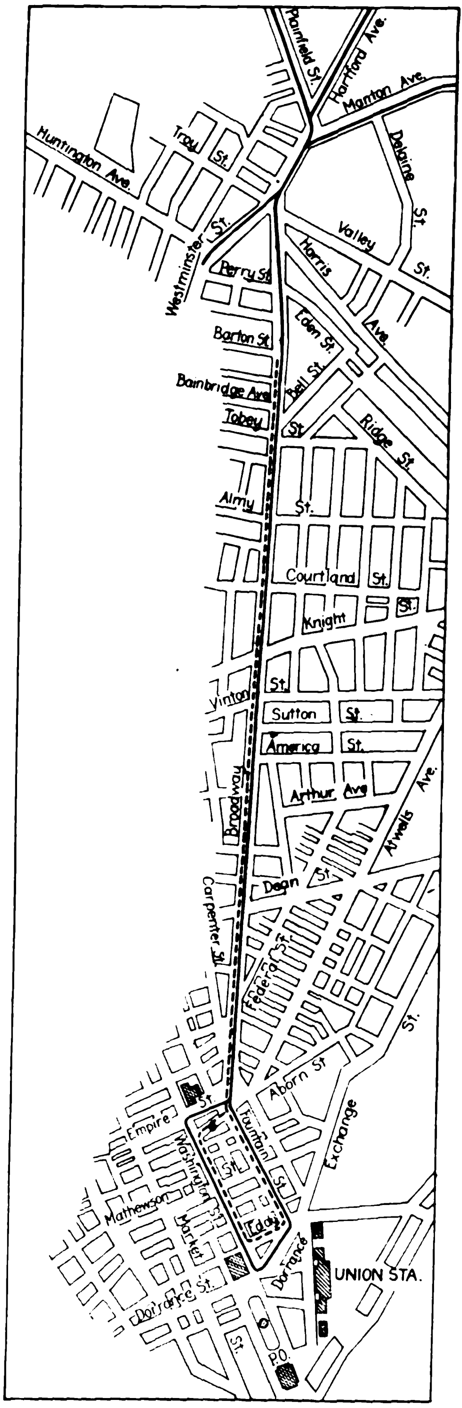
Bus operation was commenced in May, 1923, and the number of motor buses in service has been augmented from time to time as the traffic has increased. Mack, Republic and White buses seating twenty-five passengers are used. The present schedule calls for 280½ round trips per day, each half-trip requiring approximately eleven minutes. The headway and the number of buses in operation at various hours are shown in the following table:

	A.M. Rush	All-Day Base	Noon Rush	P.M. Rush
Buses	8	5	6	10
Headway	3	5	4	2½

The former headway with street cars alone was never as short as the present two-and-one-half-minute schedule and was somewhat irregular, because the cars of the several through lines and the short line cars did not divide the intervals evenly. There are 7,013 scheduled seats on the buses both ways each day, and the number of passengers averages 5,500. The outbound bus terminal is about 1,000 ft. short of Olneyville Square, to prevent the crowding of the local buses by passengers to whom the express service is available. The latter people take the cars from Olneyville Square to Providence rather than walk the 1,000 ft. to the bus terminal and the entire bus carrying capacity is therefore available for the short-haul riders. The express cars run between Olneyville Square and Exchange Place, stopping inbound for passengers to alight but not to board, and outbound to pick up but not to discharge.

In the morning the first inbound trip of the buses starts at 5:40 and the last trip at night leaves the center of the city at 1 a.m. The railway express service is operated during the same hours. Between 5:40 a.m. and 11:40 p.m. there is a starter at the inbound terminal. Two men, each working a nine-hour shift, regulate the bus service. They are solely bus men, however, and have no responsibility whatever for railway operation.

The bus stations are closely spaced, averaging only about 300 ft. apart. They are marked by twin yellow bands on the trolley poles, in contrast to the ordinary white band used to designate a car stop. In spite of the frequent stops, however, the buses' average speed for the section along Broadway is slightly over 10 m.p.h. Cars average about 16 m.p.h. through this territory. The company feels that it is undesirable to operate buses at too high a speed, and hence no attempt has been made to shorten their running time. As a result, 995,848 persons were carried by buses on this route during 224 days of 1923 without injury to a single passenger. The bus-miles per accident have been nearly double the average car-miles per accident.


Plainfield St.
Hartford Ave.
Manton Ave.
Huntington Ave.
Troy St.
Delaine St.
Valley St.
Westminster St.
Perry St.
Harris Ave.
Eden St.
Barton St.
Bell St.
Bainbridge Ave.
Tobey St.
Ridge St.
Almy St.
Courtland St.
Knight St.
Vinton St.
Sutton St.
America St.
Arthur Ave.
Atwells Ave.
Broadway
Dean St.
Carpenter St.
Federal St.
Aborn St.
Empire St.
Washington St.
Fountain St.
Exchange St.
Mathewson St.
Market St.
Eddy
Dorrance St.
Dorrance St.
UNION STA.
P.O.

Solid Line Shows Express Car Route Between Exchange Place and Olneyville Square, Providence. The Local Bus Route Is Shown Dotted

A 6-cent fare is charged on the buses. Nine metal tickets are sold for fifty cents, the same as on the cars. Payment is made by inserting the ticket in a Rooke register, or when cash fares are paid a nickel is inserted and a penny handed to the operator. Each operator must turn in as many pennies as there are nickels rung up on his register. Transfers good on car lines other than those operating on the same street are issued by the bus for 2 cents. Fare collection is pay-enter inbound and pay-leave outbound.

PARALLEL OPERATION BRINGS PROBLEM IN SNOW REMOVAL

An interesting phase of the situation created by the operation of buses and cars on the same street concerns snow removal. It was originally felt by the railway that the best plan would be to pile up the snow on the left of the vehicular roadway and on the right of the trolley track, thus making one large pile between the two lanes. There were two reasons for following this procedure. In the first place it enabled the buses to draw up close to the curb and in the second place it was thought that it would be possible to clear a wider roadway.

In practice it was found that the plan worked out nicely until the ridge of snow began to thaw and water run across the pavement to the curb. In this way the vehicular roadway

Railway Sweepers Pile the Snow Beside the Tracks and the Buses Push It Back to the Curbs

became covered with water and when the temperature fell considerably at night the water froze and made a slippery coating on the pavement.

Another disadvantage of piling the snow in the middle of the street was the necessity of opening aisles for electric car passengers to board and alight. The advantages, on the other hand, were the complete clearing of the gutters, which permitted the buses to draw up to the curb; the clearing of lanes to the sewer catch basins, permitting rapid drainage, and, most important of all, the segregation of traffic so that motor vehicles were forced to keep off of the car tracks.

What finally proved to be the greatest disadvantage of all was that the truck drivers turned into the piles in order to pass parked automobiles and spread the snow all over the vehicular roadway. This necessitated abandoning the plan altogether and pushing all the snow over to the curb. Had sufficient space been available for trucks to turn out without cutting into the central piles, the other disadvantages would not have been sufficient to cause the change. In spite of the fact that the United Electric Railways has abandoned the central piling scheme on Broadway, Providence, the company feels that this plan is theoretically a sound one. If Broadway were slightly wider than its present width of 50 ft. from curb to curb, it is thought that the central piling would have been entirely successful.

Financially, bus operation has been very satisfactory. The withdrawal of local cars from Broadway saves the railway considerable money. Against this economy the cost of bus operation to supply the local service is less than similar rail operation would be. As a matter of fact, more passengers are now being carried by cars and buses than were formerly carried by the cars alone.

Large Shop for Brooklyn

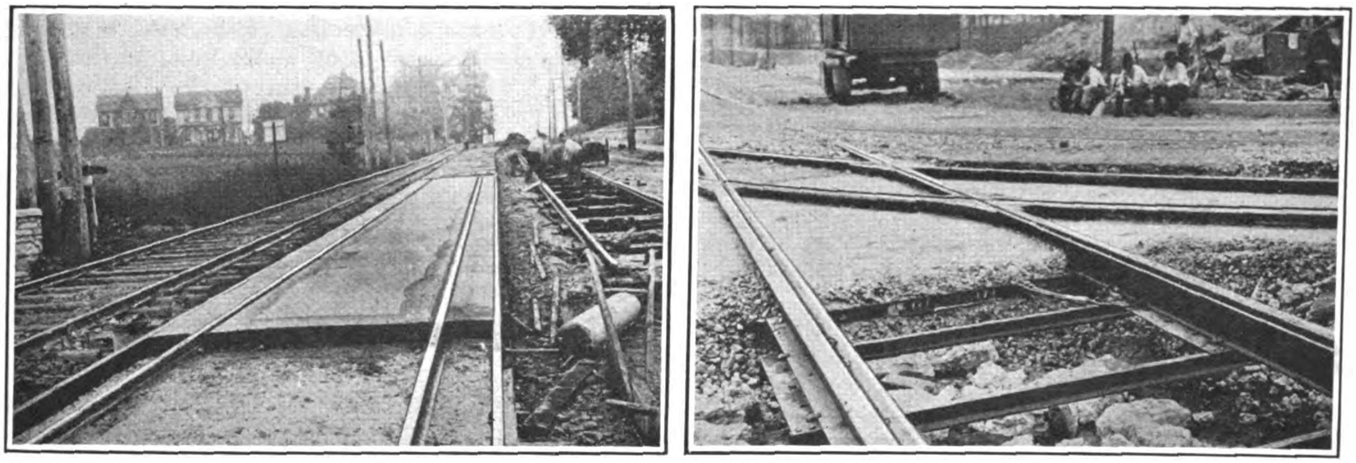
PLANS are being prepared for large repair shops for the Brooklyn Manhattan Transit Company. They will be located between the Sea Beach right of way on the west, Shell Road on the east, Avenue X on the north and Coney Island Creek on the south. This tract comprises about 60 acres, and the city has already taken title to it for the purpose of the erection of these shops. It is said that the total investment, after their completion, will be in the neighborhood of $10,000,000 and that they will be the largest electric railway repair shops in the country.

Slump Test Determines Proper Moisture for Concrete

Although It Has Not Yet Been Widely Adopted by Electric Railways, This Has Been Found to Be a Satisfactory Method of Regulating the Consistency

THERE is wide variation among different railways in the amount of water used in mixing concrete for track construction work. In general, the tendency seems to be to use a rather wet mixture. It is claimed that the loss of strength due to the pressure of excess water is compensated by the greater ease of working a wet mixture into place. Regardless of how wet it is desired to have the concrete, it is ordinarily desired to have it uniform for jobs of the same kind.

Because of variation in the moisture content of the material constituting the aggregate, however, the exact amount of water that will be required for a given concrete mixture and a given consistency cannot be specified in advance. There may be already so much water in the aggregate that the amount of mixing water necessary is considerably reduced. Fine sand or small pebbles will usually require a greater quantity of water than coarse sand or large pebbles. The quantity of mixing water recommended by the Portland Cement Association is given in an accompanying table.



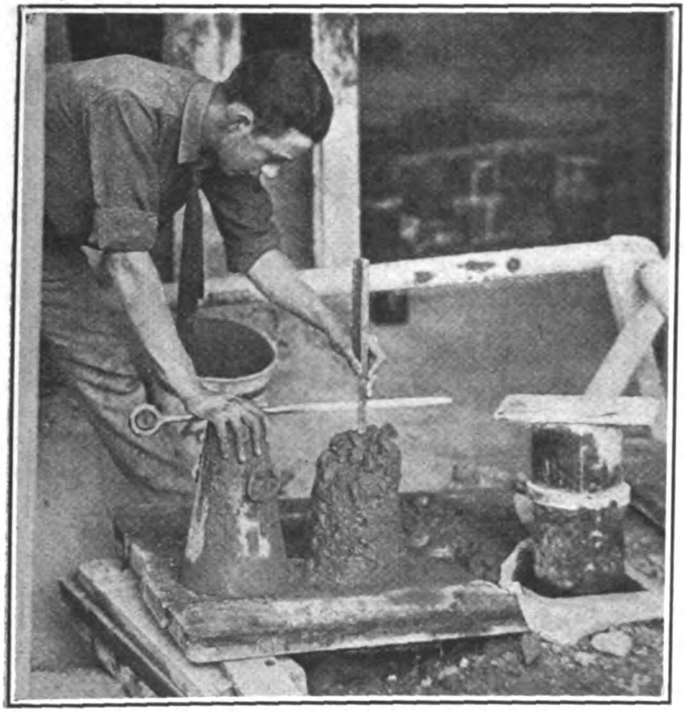
At Left—For Hand-Finished Paving Such as This a Greater Slump Is Permissible. At Right—A Moderately Dry Mixture of 1:2½:5 Concrete on Harrisburg, Pa., Track

Water is mixed in concrete for two purposes, namely, to hydrate the cement and to produce a convenient consistency. From the point of view of strength it is desirable to use as little water as possible. On the other hand, it is difficult to work a stiff mixture into the crevices around the ties and rails where concrete is used for track foundations.

APPROXIMATE QUANTITY OF MIXING WATER REQUIRED FOR CONCRETE

Mix		Approximate Mix as Usually Expressed			Water Required (Gallons per Sack of Cement)	
			Aggregate			
Cement	Volume of Aggregate After Mixing	Cement	Fine	Coarse	Minimum	Maximum
1	3	1	1¼	2½	5	5½
1	4	1	1½	3	5½	6
1	4½	1	2	3	5¾	6¼
1	5	1	2	4	6	6½
1	6½	1	2½	5	7¼	7¾
1	7¾	1	3	6	8¼	8¾

A good way to regulate the consistency is by means of the slump test. By this means the amount of mixing water used in the concrete can be carefully con-



The Settlement of the Concrete Is an Accurate Indication of Its Consistency

trolled. A sheet metal form, shaped like the frustum of a cone, 4 in. in diameter at the top, 8 in. at the bottom and 12 in. high, is the principal item of equipment for this test. A pointed metal rod $\frac{5}{8}$ in. in diameter and 21 in. long is also needed.

To carry out the slump test this form is filled with the concrete to be tested. It is placed in layers about 4 in. deep and worked around with the metal rod. The specifications of the American Society for Testing Materials state that in order to secure uniform results each layer should be rodded exactly thirty times. The form is then immediately removed and the settlement of the concrete is measured.

A mixture having a slump of only $\frac{1}{2}$ in. to 1 in. contains about the right amount of water for maximum strength, but is rather thick for practical purposes. For most work a slump of 2 in. would not be too much. For hand-finished paving as much as 4 in. is permissible

Batches should be tested from time to time and the quantity of water increased or decreased according to the amount of slump. If this is done the strength of the concrete can be controlled.

This Wet Mixture Is Used by the Northern Texas Traction Company Preparatory to Laying a Brick Pavement

Supplying Coal for Car Heaters

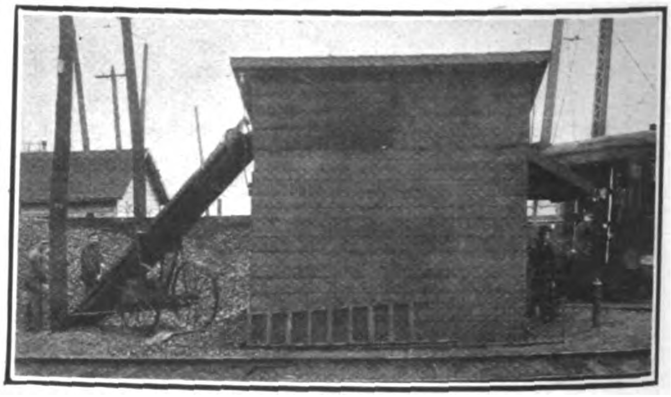
By P. V. C. See

Superintendent of Equipment,
Northern Ohio Traction & Light Company, Akron, Ohio

Taking care of the hard coal heaters in 175 cars by the method described below has cut the force handling the fires from ten men to six men and resulted in a far more satisfactory firing service. On the lines of the Northern Ohio Traction & Light Company handling heater coal has been quite a problem. Since the ground is uneven and the car storage space limited, the wheeling of the coal in wheelbarrows through the long lines of cars and then shoveling it into buckets that had to be carried into the cars took considerable time and labor. This method was unsatisfactory, and sometimes the bins on the cars were not filled up.

After a study was made at the company's Kenmore shop it was noted that in bringing the cars into the carhouse they all passed around a loop and then backed into the carhouse. Advantage was taken of this and a coal storage bin was constructed at the leaving point on the loop. This coal bin was built with chutes that could be opened so that the coal would run out into the buckets. A weighted cut-off door was installed on each chute, so that the coal handler could fill the buckets as rapidly as he could handle them without having to do any shoveling.

As each car comes in for the night, the handler has ready six or seven full buckets of coal, which he passes to the crew, who dump them into the car coal box, completely filling it up. He is able to fill the cars as fast as they come around the loop, holding them scarcely a minute, so that when the cars are all in they are all completely coaled and there is no necessity for wheeling or handling during the night.



Coal-Handling Equipment for Supplying Car Heaters

To accomplish this an electric portable coal handler was purchased, costing in the neighborhood of $600. This greatly facilitated the unloading of the hopper bottom coal cars. The device will unload a 100,000-lb. capacity coal car in two hours. The bottom of this portable conveyor is pushed under the bottom of the car and the pockets dumped. The conveyor then lifts the coal up and throws it about 10 ft. from the car, so that very little shoveling is needed. The same conveyor is then used to pick the coal from the ground and put it into the top of the coal bin.

Since this system has been installed, even with a reduced number of men, there have been no complaints of fires not being in good shape. The car coal box is loaded and the stove is clear of ashes in the morning and ready for starting a new fire.

Economic Problems of Car, Bus and Boat Transport in Paris[*]

The Management Corporation of This State-Owned System Earns Slightly More than Government Bonds of the Day—Important Improvement Is the Truckless Car—Consolidation Improves Car-Use Efficiency—Contracts Are on Annual Output Basis to Reduce Extra List While Holding to Principle of Forty-Eight-Hour Week

THE Aug. 5, 1922, issue of the ELECTRIC RAILWAY JOURNAL carried a detailed description of the state purchase and consolidation of the surface transit facilities of Greater Paris, which had been leased to a private management company while the property remains under state regulation and ownership. The agreement became effective on March 4, 1921. The following account shows how this unusual combination of state ownership and private management with bonus provisions has worked out during its first two years.

PRE-WAR AND MOBILIZATION DAYS

In the period of 1910-1914 operating conditions were so favorable that the trolleys were able to make a fair return on distance fares of 10 and 15 centimes (then 2 cents and 3 cents) second-class and 15 and 20 centimes (then 3 and 4 cents) first-class. The motor buses, following improvements in engines and tires, became profitable about the year 1914. There was every expectation that all would continue smoothly under the agreements made by the private companies of that time with the city of Paris.

Then came the war. The entire motor-bus fleet was requisitioned at once by the government in accordance with plans made in 1913. For mass transportation this left the trolleys and boats, except the Metropolitan and North-South subways. At this time the surface transport of Greater Paris comprised ten private companies and one city undertaking as follows:

General Omnibus Company
Paris and Department of the Seine Tramways
General Parisian Tramways
East Paris Tramways
Nogentais Railway
Left Shore (Rive Gauche) Tramways
Bois de Boulogne Railway
Paris-Arpajon Railway
West Paris Tramways
General Paris Steamboat Company
Belleville Funicular Railway (city-owned)

All of these concerns continued operation, although handicapped by labor shortage and scarcity of materials.

COSTS ROSE MUCH SOONER THAN FARES

The war brought an immediate increase in the cost of operation, but it was not until Feb. 8, 1919, that the fares were raised to 20 and 30 centimes first-class and 15 and 20 centimes second-class. Although the density of traffic increased from 6.24 to 9.12 passengers per car-kilometer over the period 1913-1918, the increase in expenses was much greater. For the majority of workers, wages in 1920 were triple those of 1913.

Since expenses continued to go up instead of down, the year 1920 showed a deficit like all of its war predecessors. Earnings per car-kilometer were 2.18 francs, but cost of service was 2.91 francs. In April, 1920, fares were raised again, making the second-class rates 25 and 35 centimes and the first-class rates, 35 and 50 centimes.

On granting the first increase in fare, the Department of the Seine and the city of Paris made a provisional agreement with the railways that was to hold until Dec. 31, 1920, pending the working out of a permanent plan. Under this agreement the operators were to be allowed a 4 per cent return, and accordingly, a special war deficiency account was set up in the hope that costs would soon go down enough to permit this return to be made out of operating surplus.

THE STATE PURCHASE OF THE RAILWAYS

As private capital did not care to continue in a losing venture, it was necessary for the state to take over the properties and operate them or lease them to a private organization. The latter method was chosen, with personnel drawn largely from the General Omnibus Company, which was the leading organization and which operated both buses and cars. Six companies were in the agreement by Jan. 1, 1921; the boat company by August, 1921, and the Boulogne and Arpajon railways by Jan. 1, 1922. The remaining private company, namely, Western Paris Tramways, continued to operate independently.

Under the plan the operation is conducted for the account of the department, which retains control of fares and service. In consequence all the receipts belong to the department and all expenses are charged against it, and it bears the responsibility for a surplus or a deficit.

For that reason the operating accounts of the property are carried in a "General Management Account" kept by the company and divided into three parts, as follows:

1. Financial accounts (fixed charges, including interest, amortization, etc.).
2. Operating accounts (all receipts and expenditures of operation, direct or indirect).
3. Remuneration for the company.

The remuneration of the operating company is made up of the following elements:

1. A return of 6 per cent on the new capital of 60,000,000 francs.
2. A management premium on all receipts, direct or indirect, except interest on funds invested, of 0.75 per cent on receipts up to 250,000,000 francs and of 1 per cent on anything in excess of that amount.
3. An efficiency premium based on the formula $E = 0.04\,(R - 0.65\,D)$, in which R represents total receipts from operation and D the cost of service, which includes all fixed charges such as interest and amortization of

---

[*] This article is based largely, but not entirely, upon a paper by A. Mariage, general manager of the Paris car-bus-boat combine, read before the Société des Ingenieurs Civils de France, Feb. 9, 1923, and reprinted in the November, 1923, issue of *L'Industrie des Tramways, Chemins de Fer et Transports Publics Automobiles.*

the purchase sum, war loans (deficiency account) and rehabilitation costs.

Out of this compensation, the company pays its board of directors and some forty-five heads and sub-heads of departments in addition to their salaries. The officials also receive a pro rata share of the economy bonus.

In practice the "operating premium" works out to only 24,000 francs for every 1,000,000 francs addition to the receipts. Furthermore, the department shares in any profits that remain after 8 per cent is paid to the stockholders up to the point where it would be possible for the department to acquire 75 per cent of the surplus.

At pre-war prices, the value of the combined undertakings was 400,000,000 francs. The working capital of 60,000,000 francs supplied, according to the agreement, by the Société des Transports en Commun de la Région Parisienne merely served to care for supplies, pay of personnel and advances to equipment makers. It was not sufficient for general rehabilitation and basic betterments. The allowed return of 6 per cent plus both operating and efficiency premiums was not a sufficient incentive to private capital, as government loans were then paying a better return. For this reason, the Department of the Seine itself made two bond issues at higher rates of interest in order that the company might carry out the improvement program. Thus the ELECTRIC RAILWAY JOURNAL for Feb. 11, 1922, noted that the Department of the Seine had offered a twenty-year, 7 per cent external gold loan for $25,000,000 in the United States coincident with a similar issue for $12,500,000 through British bankers. These bonds were offered at 90½ per cent of par. The actual rate of return of 7.78 per cent on these issues almost equals that earned by the company in 1922.

WHAT THE CONSOLIDATION NOW COMPRISES

The society now operates all surface and water transport facilities in Greater Paris exclusive of the Western Paris Tramways and the city-owned Belleville Funicular Railway. The outstanding data, which show its extent, are given in the table in this column.

At this time, power was supplied from three interconnected stations at Vitry, Saint Denis and Billancourt. Eventually, power will be supplied primarily from a central station at Gennevilliers, leaving the present stations for standbys.

PARIS SURFACE TRANSPORT, LAND AND WATER

ROUTES AND LENGTHS

	Total Equivalent Single Track Kilometers	Total Equivalent Single Track Miles
130 surface car routes	970	601.4
53 motor-bus routes	335	207.7
4 railways on right-of-way	265	164.3
1 steamship line	23	14.5
183 routes	1593	987.9

ROLLING AND FLOATING STOCK

Motor cars	1,779
Trail cars	869
Motor buses*	1,100
Steam locomotives	38
Freight and service cars	380
Steamboats (400-passenger capacity)	49

*By October 1923, there were reported 1,369 four-wheel buses seating twenty-three to thirty-eight with last capacity standard; fifty-one six-wheel, forty-eight-seat buses and six trackless trolley buses.

SHOPS, POWER DISTRIBUTION, OFFICES, ETC.

50 inspection centers, area	479,500 sq. meters
5 maintenance plants, area	73,200 sq. meters
1 headquarters, area	2,400 sq. meters
32 substations, rated capacity	62,000 kw.
1 fuel depot, area	12,260 sq. meters
Total tank capacity (underground storage)	1,200,000 liters

TRANSPORTATION STATISTICS, 1922

Vehicle-kilometers for the year	135,596,979
Average daily vehicle-kilometers	371,500
Passengers carried	917,723,323
Passengers carried daily (average)	2,514,310
Receipts for the year, francs	306,801,227
Average daily receipts, francs	840,551

As early as 1910, the chief predecessor company operated two-car trains double-end by means of control equipment on the trailer. This arrangement eliminates the necessity of coupling at terminals. Fears with regard to operation around curves and with the trailer at the front of the train have proved groundless.

Although the tramcars that have been standard from about 1913 onward were fitted with light-weight, commutating pole motors and other improvements that made them unusually light in comparison with earlier designs, the management took another step forward in 1921 with its forty-nine-seat "Type L" truckless car (see ELECTRIC RAILWAY JOURNAL, Dec. 2, 1922), in which the principle of separate truck and body has been abandoned in favor of automobile methods of combining chassis and motor. There are two 45-hp. motors per car, bevel-gear drive and band brakes. Empty, this car weighs 11.5 metric tons compared with the 14 metric tons of its predecessor, "Type G," of equal capacity. The weight per seat is 519 lb. against 610 lb. in the earlier type. The new cars have less unsprung weight, less track upkeep, less first cost and 20 per cent reduction in energy consumption. They are to replace existing cars as the latter wear out, or as additional cars are needed.

As regards motor buses, the four-wheelers have been standardized with thirty-eight seats instead of thirty-one or thirty-five. The six-wheel bus (see *Bus Transportation*, May, 1923, and January, 1924) seating forty-eight and intended for operation over the wider streets and boulevards had already been ordered to the number of fifty early in 1922, but the latest news indicates that it is too awkward for wider application because downtown Paris has too many narrow streets.

Without committing itself to the general desirability of using the "national" fuel, industrial alcohol, in preference to gasoline, the management has made tests which prove that so far as propulsion is concerned, alcohol is satisfactory. The company has a department of studies and technical control for research in fuels, carburetors, process of manufacture, drive, etc.

FINANCIAL RESULTS IN 1921 AND 1922

In the year 1920 the Paris General Omnibus Company alone had an operating deficit of 37,000,000 francs; and the grand total loss of the companies now in the consolidation was 70,000,000 francs. In 1921, however, the loss was cut to 21,000,000 francs despite the fact that wages alone were increased by 27,500,000 francs. In 1922, receipts and operating expenses were almost even, the operating deficit being only 689,447 francs. As shown in more detail in the ELECTRIC RAILWAY JOURNAL for Oct. 27, 1923, the outstanding figures for the year 1922 were these:

	Francs
Total revenue	303,581,980
Operating expenses	304,271,426
Operating deficit	689,447
Charges payable by Department of Seine on sinking fund, war fund guarantees, new capital, etc	42,600,188
Remuneration to company	9,191,335
Add operating deficit	689,447
Deficit in true cost of service	52,480,970

Of the item "remuneration to company," 3,600,000 francs were merely the 6 per cent return on the 60,000,-

000 francs of new (operating fund) capital; 2,425,158 francs was the management premium and 3,166,177 francs the economy bonus. Therefore, aside from the less than current rate of return on capital, the company received only 5,591,335 francs on a turnover of 303,581,980 or about 1.8 per cent. Its dividend to stockholders came to 8.5 per cent, but as noted previously this is not very attractive when the department's own bonds issued to non-working investors yield 7.78 per cent.

One of the factors that helped to reduce the deficit was the more intensive use of equipment. In 1920, the motor cars were active only 65 per cent of the possible time; 77 per cent in 1921 and 80 per cent in 1922. Trailer effectiveness also rose from 42 per cent in 1920 to 85 per cent in 1922. As a result, the tramways in 1921 carried 5.1 per cent more passengers than in 1920, and because of higher fares earned 16.3 per cent more revenue. In 1922 the tramway receipts were 6.4 per cent higher than in 1921.

RELATIONS OF CAR AND BUS IN GREATER PARIS

In 1921, the cars of the combine ran 85,115,000 km. The buses ran 35,220,000 km., or almost 30 per cent of the total. In 1922, the cars ran 91,817,000 km. and the buses 43,210,000 km., or 32 per cent of the total. In the first six months of 1923, the buses alone ran approximately 24,296,000 km. In 1922, the cars brought 63 per cent and the buses 35 per cent of the revenue. The remaining 2 per cent was almost equally divided between the steam railways and the boats.

In considering these figures, one must bear in mind that in a large portion of inner Paris there is a surface monopoly of the buses; that the underground rapid transit lines are really short-haul distributors of traffic within Paris itself; and that the chief long-haul electric business, paradoxically as it may seem, is done by the suburban tramways.

Perhaps no true comparison of tramway and motorbus costs is possible under circumstances involving such radical changes in financing, prices and operation. However, the available detail accounts for the year 1921 show that the operating cost per kilometer of cars tending to average forty-nine seats was 2.18 francs, while buses ranging from thirty-one to thirty-eight seats cost 2.47 francs. The fuel costs of both classes of vehicles dropped in 1922, as both coal and gasoline show a decline of about 30 per cent in unit costs.

The receipts per car rider in 1921 averaged 0.33 franc and the density per car-kilometer 7.06 passengers. The corresponding bus figures were 0.36 franc and 6.67 passengers. The tramway receipts for 1921 show an average of 2.12 francs against expenses of 2.18 francs. The bus receipts show 2.54 francs against expenses of 2.47 francs.

While the six-wheel forty-eight-seat bus has been found advantageous from the standpoint of capacity, it is heavier per seat than the other buses. The latest tendency is in the opposite direction of smaller, more mobile units of twenty-three-seat capacity.

Inasmuch as the platform cost is the outstanding factor, although the wages paid are beyond the control of the management, every possible way of saving time to increase revenue-miles per hour must be utilized. One innovation that seems small in itself but which has proved of value from a time and good-will standpoint relates to the police investigation of accidents, such as collisions.

Formerly a good deal of time and ill-will was involved every time a policeman had to secure from the motorman his name, run number and other facts which would locate him promptly should he be needed later. Today, each operator carries a card already prepared for quick turn-in to M. le Gendarme! There is no opportunity for argument or embarrassment.

Another step is the Commercial Department (Direction de l'Exploitation Commerciale), whose job it is to make most effective use of the vehicle-kilometers manufactured. The management does not hold that the simple figure of "passengers per kilometer" is a true index of the best use or the proper use of the service. Thus in pre-war days the density averaged seven passengers per kilometer (11.2 passengers per car-mile). During the war with congested conditions this density exceeded nine passengers per kilometer (14.4 passengers per car-kilometer). It is not a high figure due to overcrowding at peaks that indicates efficiency, but a high figure that comes from a good load factor throughout the operating day. Hence the desirability of studying ways and means that will give service in the way most encouraging to off-peak travel and yet cause minimum dissipation of a product which must be either consumed or lost the instant it is produced.

USING THE PLATFORM MAN'S TIME EFFECTIVELY

Besides refraining from charging fares that would discourage traffic, no matter how justifiable in theory, the management has given exceptional attention to efficient use of its personnel within these legal limitations:

The average working week must not exceed forty-eight hours, with one day off in seven.

Platform time is on the basis of an eight-hour day.

The working day must not exceed nine and one-half hours (straight run).

The elapsed-time working day must not exceed thirteen and one-half hours (swings).

Meal times are counted as part of these over-all periods.

Sunday layoffs shall be fairly equal to average weekday layoffs.

Twenty-one days vacation is given in each year with pay, and vacations are to be taken between March 1 and Nov. 1.

Within these limitations, it appears that the management is entitled to a total of 2,360 hours per man in ordinary years and 2,368 hours in leap years. Out of this total it is necessary to build runs that will require as few extras as possible on Sunday, which is the biggest traffic day in Paris (markets are open Sunday mornings, for example) and during the vacation season, which happens also to average more traffic per month than the interval Nov. 1-Feb. 28.

By agreement with the union, the men accept a longer average working day during the vacation season; and likewise they accept a longer period on Sunday than on the other days of the week. Between March 1 and Oct. 31, the average working day is eight and one-fourth hours; while in the non-vacation period, the average is only seven and one-half hours. To take care of the Sunday peaks, the men accept an average week of forty-nine and one-half hours during the vacation season, and in exchange they work only a forty-five-hour week the remainder of the year.

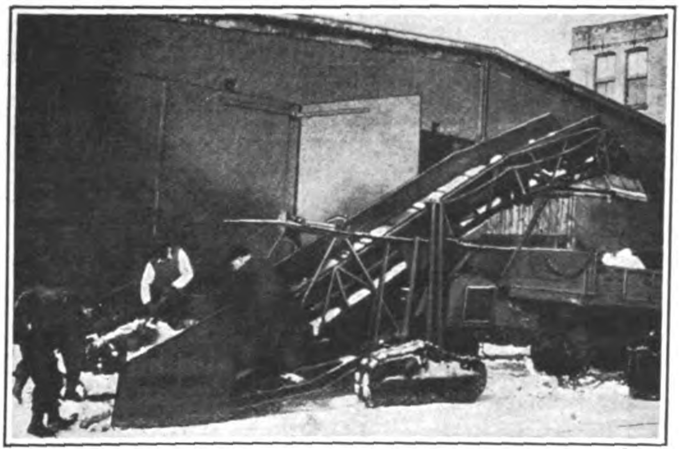
General Manager Mariage states that this novel division of labor time has given a high degree of suppleness to meet variations in traffic. He compliments the union for its understanding of the problems involved.

As for the undertaking as a whole, while naturally desirable to make it pay for itself, he believes the Department of the Seine ought not hesitate to finance further improvements so long as it appears that the general good of the public is served thereby.

Snow Loader Is a Great Labor Saver

One Truck Filled Every Two Minutes Was Average Maintained Over a Period of Hours by Springfield Street Railway During Recent Storm

IN SPRINGFIELD, MASS., there is a mutual agreement between the city and the Springfield Street Railway that instead of removing the snow from between the rails and 18 in. outside of the tracks all over the city, the railway shall remove all of the snow from an equivalent area and for the full width of the street. As a result the snow removal work of the railway is confined to one end of the city, and its force is concentrated, instead of the men being scattered around.



This Snow Loader and Four Men Clear the Streets More Rapidly than Would a Much Larger Force Working with Shovels

During a snowstorm the railway's plows and sweepers pile the snow in windrows clear of the tracks. When the storm has stopped motor trucks equipped with plows push these windrows back to the gutter. Following the motor truck plow, a Barber-Greene snow loader is put in operation. An attempt is made to keep the snow piles thus pushed back just clear of the gutter, as it has been found that by piling the snow in this manner it is possible to operate the snow loader so that the machine does not rub against the curbstone.

The dump trucks are lined up a considerable distance behind the snow loader facing backward. They back as the loader moves along, but keep sufficiently far away not to interfere with it or with the truck that is being loaded. The city assigns a policeman to keep vehicular traffic out of the way. As soon as a load is received the belt conveyor of the machine is stopped, the truck starts for the dump and another truck backs into place. The machine is then started again and the next truck is loaded.

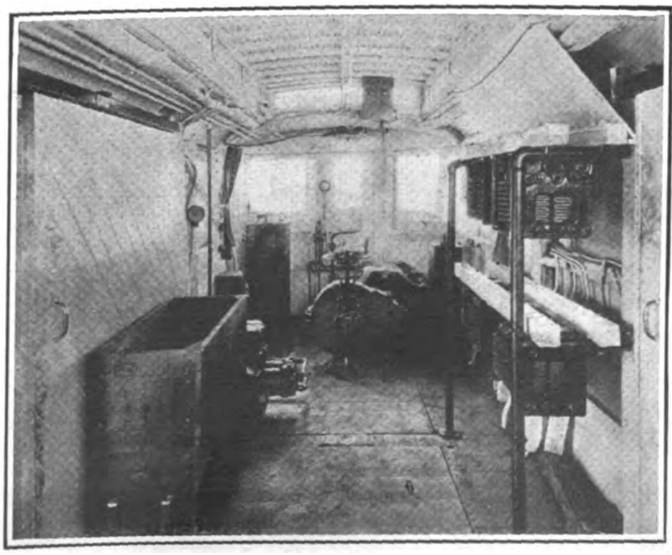
The streets from which the railway has agreed to remove the snow vary from 50 ft. to 70 ft. in width. To haul the snow from the street to the nearest dump 5-ton trucks are employed. In the downtown district snow is dumped through manholes of the new Memorial Bridge over the Connecticut River.

The organization for operating the snow loader consists of two men who precede with shovels and throw any loose snow into the general pile, two men who shovel snow into the hopper of the snow loader, one man who operates the machine, and as many motor trucks and drivers as are needed to keep the loader continuously at work. This apparatus has been able to keep seventeen 5-ton trucks busy continuously and have some spare time. A single 5-ton truck can be loaded in about forty-five seconds. Over a period of six hours an average of one truck has been filled every two minutes. During a recent storm one snow loader and four men in Springfield covered one side of a street a mile long in approximately four hours. The Springfield Street Railway has found the apparatus to be very efficient, and it has saved the company considerable money.

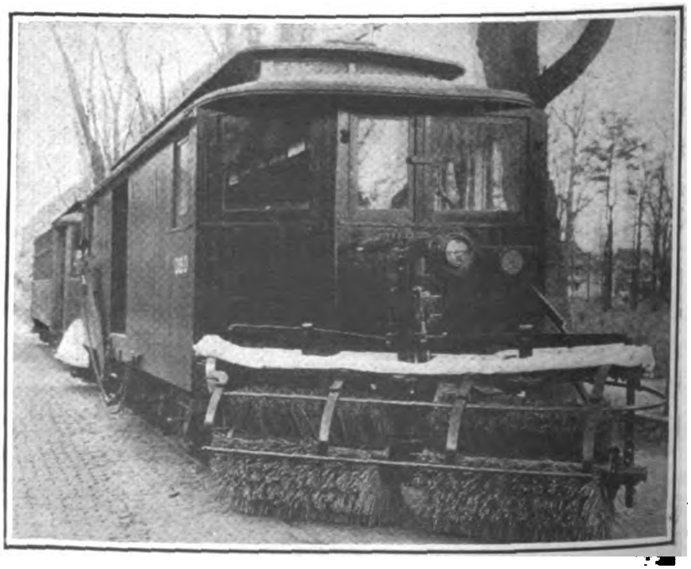
Open Cars Converted Into Snow Sweepers

All Equipment Except the Brake Cylinder Has Been Placed Inside—Removable End Panels Facilitate Replacement of Broom Motors—Steel Strips Reinforce the Rattan in the Brooms

EFFICIENT snow-fighting units have been constructed by the Worcester Consolidated Street Railway from obsolete open cars. Eleven sweepers have been built in this way at Worcester and nine more have been built for the Springfield Street Railway. These machines have proved very satisfactory for snow fight-



The Absence of Chains and Countershafts Makes the Interior of This Home-Made Snow Sweeper Convenient and Roomy

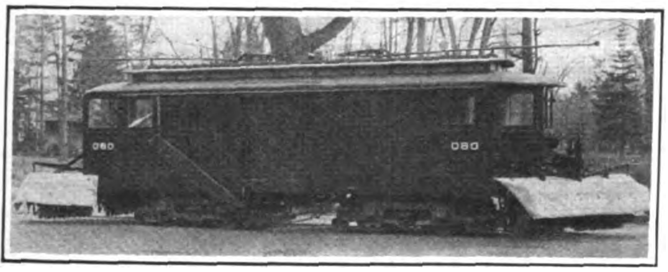


The Canvas Screen Is Fastened to a Metal Frame at the Top so that It Can Be Thrown Back When Desired ing and are considered by the railway to be superior to other types previously used. A double-truck snow sweeper is thought to excel a single-truck unit because it can clean up deeper and heavier snow at greater speed. Moreover, the expense involved in this reconstruction was small.

The body of the sweeper is that of an old fifteen-bench open car which had been shortened 5 ft. at each end. The original trucks were used and on them are mounted G.E. type 67 motors. The broom axles are supported by extensions to the underframe of the car. A heavy tie rod runs from this framework up to the letterboard on each side, along the entire length of the body and down to the frame at the other end. These braces have turnbuckle attachments at the ends, by means of which any drooping of the noses can be prevented.

Each broom is driven independently by a G.E. type 67 motor. Gear drives manufactured by the Russell Car & Snow Plow Company are used. The absence of chain, countershaft, clutches, etc., in the middle of the car gives it a roomy appearance and facilitates the work of the crew.

An interesting feature of the body construction is that the diagonal ends of panels are removable. This permits the broom motors to be taken out quickly and easily. In case of trouble on the road with the broom motor, the sweeper can be pulled into the carhouse and the motor replaced in about half an hour.



Converted Open Cars Make Efficient Snow Sweepers at Worcester

A canvas curtain somewhat different from that ordinarily employed on snow sweepers is used to limit the throw. This curtain is attached to a metal frame the weight of which holds it down in spite of the force of the snow thrown by the rapidly revolving brooms. The frame is hinged at the top, however, so that the curtain may be lifted up at night when there is no vehicular traffic on the street and when it is desired to throw the snow as high and wide as possible.

An extra set of brooms is kept on hand for every sweeper so that in case of a storm of long duration worn brooms can be replaced and the sweeper quickly returned to service. In order better to cut ice and sleet as well as to prolong their useful life, the broomheads have ribbon steel interspersed with the rattan.

All equipment and wiring excepting only the brake cylinder has been placed inside the body. When the sweepers are run into the shop, a steam hose can therefore be applied to all the underparts to melt off the snow and ice quickly. This greatly facilitates the inspection work. No equipment is removed from the sweeper during the summer. Although such apparatus as controllers, motors, air compressors and the like are the same as those used on other cars, the railway considers it more economical to leave the equipment permanently on the sweepers. They are then instantly available whenever needed for service.

Bus Development by the Boston Elevated

The Company Now Has Thirty-three Buses, Which Are Used Largely in Supplementary Service at the Outer Terminals of Rapid Transit Lines

THE first bus line operated by the Boston Elevated Railway began service between Allston and Watertown, Mass., in February, 1922. Since then the company has gradually added buses until it now has thirty-three. These consist of one Republic-Knight, twelve Mack and twenty White buses. All are of the one-man twenty-five-passenger type.

All of these buses do a feeder service in the suburban districts, and operate as an integral part of the Boston Elevated system. That is to say, the same fare is charged as if the service was given by surface cars, and transfers are given between buses and cars, just as they would be if trolley cars only were used. In several of these cases, the buses take the place of trolley lines, when, because of the need of track reconstruction, or for some other financial reason, the company thought it undesirable to continue the rail service. A typical case of this kind, although on a more extensive scale than usual, was in Malden and was described in an article in the ELECTRIC RAILWAY JOURNAL for Oct. 6, 1923, by Edward Dana.

STATISTICS OF SERVICE

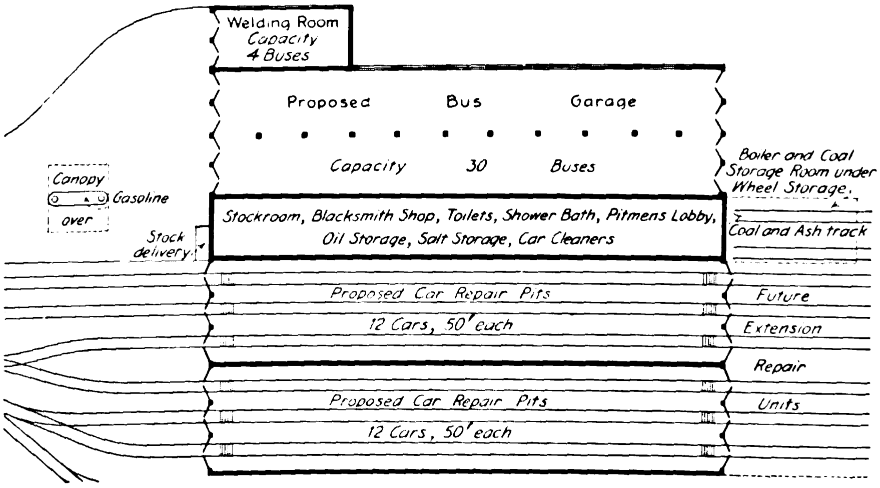
For the service in January, 1924, the last month for which figures are available, the company had thirty-three buses, of which twenty-three were required for regular operation and ten were used as spares, or

BOSTON ELEVATED RAILWAY MOTOR BUS OPERATION—
MONTH OF JANUARY, 1924
Number of Buses in Regular Service — Thirty-three

		Per Revenue Mile (Cents)
Round trips	14,998	
Revenue-miles	57,093	
Non-revenue-miles	3,721	
Total miles	60,814	
Bus-hours allowed time	7,692	
Bus-hours running time	5,172	
Total revenue passengers	312,577	
Operating Expenses:		
Maintenance of Equipment		
Painting and varnishing	$6.75	
Repairs to bodies	544.34	
Repairs to chassis	1,914.22	
Tire renewals	743.95	
Repairs to engines	1,138.54	
Repairs to storage batteries	375.05	
Total Ac. 30	$4,722.85	
Ac. 40 depreciation (*a*)	3,207.52	
Total maintenance including depreciation	$7,930.37	13.89
Total maintenance including depreciation per total miles operated	13.04 cents	
Power:		
Ac. 53 Gals. of gasoline	15,392	
Cost of gasoline	$1,647.98	2.89
Total miles operated per gallon	3.95	
Transportation:		
Ac. 63 Superintendence and instruction	$342.61	0.60
64 Wages of operators	8,056.09	14.11
67 Lubricants	66.99	0.12
67 Miscellaneous supplies for buses	105.25	0.18
70 Garage employees	619.08	1.08
71 Garage expenses (heating, lighting, etc.)	548.90	0.96
71 Garage expenses, rentals	529.17	0.93
Total transportation	$10,268.09	17.98
Total operating expenses	$19,846.44	34.76
Investment in buses, 6 per cent	1,056.67	
Investment Allston garage 6 per cent on one-half of investment	75.00	
Taxes, 2 per cent	377.22	
License fees	30.00	
Total interest and taxes	$1,538.89	2.70
Total cost of service (*b*)	$21,385.33	37.46

(*a*) Depreciation of buses carried on a five-year basis, with allowance of 10 per cent salvage.
(*b*) No charges included for general and miscellaneous expenses.

during peak loads. The management of the Boston Elevated Railway considers that in a number of respects the conditions under which the buses operate are unfavorable for a good showing. In the first place all of them, under the fare system of the company, carry passengers for 5 cents if no transfer is required, and most of them are on light traffic lines. Under such conditions inefficient schedules are inevitable. In the second place the lines are quite scattered so that housing and maintenance cannot be carried on under the most desirable conditions. This situation is improving, however, as the company has built or leased some garages and has a program of garage construction under way. In the third place, operation and drivers are new. This has meant the breaking in of nearly all drivers, who naturally are not as expert in this work as they will become by more experience. It should be said on the other side, however, that the care and operation of automotive equipment are not new matters on the Boston Elevated. The company has had for some years a good sized equipment of motor tower wagons, emergency trucks, inspectors' automobiles, tractors, etc., numbering at the present time about 120. For this reason it has necessarily had to provide for the repair of this equipment, so that the maintenance of the Boston Elevated's fleet of buses has not been in inexperienced hands.



At Its Medford Depot Headquarters, the Boston Elevated Railway Proposes to Add a Thirty-Bus Garage, Adjoing the Carhouse

Since the establishment of its first bus line in February, 1922, the company has carefully maintained operating figures, both statistical, as to the runs of individual buses, and financial.

The mileage statistics for January, 1924, showed that ten of the buses during the month ran more than 2,000 miles, as follows: 2,835, 2,830, 2,744, 2,550, 2,504, 2,480, 2,280, 2,253, 2,110 and 2,074. The table on page 419 shows general operating statistics and operating expenses of the company's motor bus service for January, 1924, though in this statement no charge is included for "General and Miscellaneous Expenses."

FINANCIAL STATISTICS EXPLAINED

In this statement it should be said that the number of 10-cent fares, mentioned under Operating Statistics, means the number of passengers requesting transfers, usually to continue the trip downtown on a rapid transit line.

The monthly charges on maintenance and depreciation of equipment of course vary greatly, according to the work required, during the month, but the total given of 13.89 cents per revenue mile operated by the buses does not vary greatly from the other monthly figures during 1923. Depreciation is charged each month on the basis of an assumed life of five years for the bus and a salvage value at the end of that time of 10 per cent, based on its purchase price.

Under "Conducting Transportation" the operators' wages are based on a payment of 78 cents per hour. This is also the rate paid on the surface cars under the last arbitration decision and is made up of a base rate of 70 cents plus a premium of 8 cents for one-man cars or buses.

Under Fixed Charges, the items are self-explanatory, the interest being based on the annual rate of 6 per cent on the purchase price of the buses and the taxes on 2 per cent of the purchase price of the buses and garage investment.

Gasoline is purchased partly at the wholesale rates, where the company has storage accommodations and partly at the retail rate. The latter during January in Boston averaged about 19 cents.

The receipts of these buses during January were slightly less than the total cost of service as given in the accompanying statement. In other words, the buses at present do not pay operating expenses, including depreciation and fixed charges, but this was not expected under the conditions under which they operate.

NEW GARAGES UNDER CONTEMPLATION

The principal garages of the company at present are one at Allston, one at Hyde Park, and one at Riverside Avenue, Medford. The latter was built originally for a commercial garage but leased by the company until it can construct proper garage facilities. To take the place of the latter the company contemplates the construction of a garage to hold thirty buses at Medford, adjoining its Salem Street carhouse. Between the carhouse and the garage will be a long, narrow building to accommodate the stockroom, blacksmith shop, toilets, pitman's lobby, oil storage, storage, accommodations for the car cleaners, etc. The accompanying diagram shows the general arrangement. No special lobby for the bus operators is contemplated, because they will share the lobby now on this area used by the car platform men.

On the opposite side from the storeroom is a welding room with capacity for four buses, where carbon in the cylinders can be burned out, etc. The building construction itself is of brick with mill construction roof and steel columns. The floor is concrete and there are no pits, but a trestle will be built on which buses can be run for underneath inspection. The end doors are 12 ft. wide and 14 ft. high, this height admitting a tower car. Gasoline storage is provided outside under a canopy. There is a driveway at each end so that buses can enter from the front or rear of the garage.

While this particular garage has been designed so that, if necessary, it can be used as a carhouse, it is the policy of the company when laying out or rehabilitating division depots at yards to make provision for the possible future care of buses, as well as cars.

Association News & Discussions

Bus Accounting Discussed at Fort Wayne

Operating Costs Compared with Those for Electric Railways—Officers Also Elected at Annual Meeting of the Central Electric Railway Accountants

BUS accounting was the main topic discussed at the two-day meeting of the Central Electric Railway Accountants' Association, held at Fort Wayne, Ind., on Feb. 29 and March 1. At the session on March 1 L. J. Wertzler, assistant auditor Chicago, North Shore & Milwaukee Railroad, presented an extended paper on this topic, treating not only accounting for buses but methods of establishing rates and other allied matters. This paper was published in abstract in last week's issue of the ELECTRIC RAILWAY JOURNAL. An abstract of a prepared discussion on this topic, presented by F. E. Belleville, auditor Louisville Railway, is published in this week's issue.

In the following discussion J. S. Bleecker, formerly general manager Indiana, Columbus & Eastern Traction Company, and now with Day & Zimmermann, spoke about the operation of buses by the I. C. & E. and also the bus operation in general. The point emphasized by Mr. Bleecker was that the traveling public is demanding this class of transportation, which in a measure is new business not at the present time enjoyed by the electric railways. To secure this new business and at the same time protect the electric railways from unfavorable competition, the electric railway should engage in the operation of buses. Mr. Bleecker declared that maintenance cost would necessarily be lower on buses operated by a railway company than on those of outside concerns and that bus operation could be used in place of electric cars which are now being operated at a loss.

Another point discussed at the meeting was that of transporting passengers on tickets which would be valid either on a bus operated by the railway company or upon the railway cars, according to the wishes of the passenger. This point was developed further as to the feasibility of transporting the passenger on the bus and checking baggage on the railway car, which would possibly be desirable in cases where severe competition exists.

W. L. Wilt, special representative Pennsylvania Railroad, Chicago, Ill., gave a very interesting talk on the railroad situation in general, covering the subject of valuation, basis of rate making and the effect of the recapture clause of Section 15A of the interstate commerce act. Mr. Wilt presented some interesting statistics compiled by the Pennsylvania Railroad as to the disposition of revenue received from freight, passenger, mail and express business, also the distribution of the "bread dollar" comparing the transportation revenue to that of the various features entering into the cost and profits of this commodity.

ASSOCIATION BUSINESS AND ELECTION OF OFFICERS

In accord with the rules of the association, the discussion on the afternoon of Feb. 29 covered differences in accounting methods as between different roads, and resulted in several properties agreeing to conform more generally to the working rules indorsed by the association.

The committee reports rendered on March 1 indicate progress, but no definite recommendations were made.

The following officers were elected for the coming year:

President, L. W. Van Bibber, auditor Indiana, Columbus & Eastern Traction Company, Springfield, Ohio.

First vice-president, J. P. Longon, auditor Cincinnati & Dayton Traction Company, Dayton, Ohio.

Second vice-president, Tudor W. Jones, auditor Union Traction Company of Indiana, Anderson, Ind.

Secretary-treasurer, L. E. Earlywine, Traction Terminal Building, Indianapolis, Ind.

Executive committee: C. E. Baker, auditor Lima-Toledo Railroad Company, Lima, Ohio; V. R. Shick, auditor Fort Wayne & Northwestern Railway, Kendallville, Ind.; C. A. Dugle, auditor Indianapolis & Cincinnati Traction Company, Rushville, Ind.; H. F. McColgin, auditor passenger receipts Interstate Public Service Company, Indianapolis.

It was decided to hold the next meeting at Cleveland on Aug. 15-16.

Bus Operation Is Benefiting Louisville*

De Luxe Service at a 10-Cent Fare Is Given in Motor Coaches—Also Elected at Annual Meeting of the Central Electric Deficit Is Growing Smaller

BY F. E. BELLEVILLE
Auditor Louisville Railway

IN LOUISVILLE we are getting away from the use of the word "bus" as applied to the kind of service generally furnished by a responsible transportation company, such as a street railway. We are attempting to dignify the de luxe service rendered by us by calling it "coach service" and in all cases referring to the passenger equipment as "motor coaches." Our motor coach operations are not carried on by the Louisville Railway, but by a subsidiary company, Kentucky Carriers, Inc., whose operations are entirely in the charge of officials of the Louisville Railway.

It has been said that most railway companies engage in the operation of motor coaches primarily to keep the other fellow out. This is not exactly the case in our city, nor do we believe it to be generally true in other cities. As we all know the present operating companies already have the organizations necessary to engage in this new arm of transportation, and it is but logical that they should engage in this field to secure unified transportation service.

In Louisville the question of installation of motor coach service had been discussed for some time, quite generally by people residing in sections of the city not directly served by street cars, and also by the operating officials of the railway and the conclusion was reached that eventually a profitable business could be built up. A survey of the city was made, and as a result the company commenced operations on June 24, 1923, with six coaches, operating over one route. In July, 1923, six additional coaches were added and another route was opened. Later one of these routes was discontinued and a service was inaugurated in another section of the city in the hopes that a more productive territory could be reached.

We do not regard coach service as exactly parallel to street railway service. Every community has many private automobile owners who use their machines extensively between their homes and the office, store or shop, because they desire some means of transportation better than is afforded by street car service. The increasing difficulties in finding suitable parking space in the downtown business districts, together with cost of operation, we believe, are gradually discouraging the use of automobiles by private owners, and it is this class of people whom we hope to reach by the use of motor coaches.

The results of operation for the first six months, while showing an operating loss, are not entirely discouraging, as the operating deficit has been considerably decreased during the later months. While this is partly due to a lower selling price of gasoline, it is also partly due to a gradual increase in earnings per coach-mile. Passenger revenues averaged about 12½ cents per coach-mile during the summer months of 1923, while during the last three months the average will run about 15½ cents per coach-mile. In some cities this increase in revenue might be attributable to adverse weather conditions, but in Louisville we have had a comparatively mild and open winter, as is usually the case, and, we believe this increase to be a natural growth in the business which will continue.

---

*Abstract of discussion presented at the meeting of the Central Electric Railway Accountants' Association, Fort Wayne, Ind., March 1, 1924, of the paper on "Bus Operation and Accounting," by L. J. Wertzler, published in the ELECTRIC RAILWAY JOURNAL for March 8, page 387.

Our operating expenses and taxes for the first six months of operation averaged 19.21 cents per coach-mile operated. Included in operating expenses are depreciation charges on passenger equipment at the rate of 25 per cent per annum, and accruals to reserve for tire repairs and renewals at the rate of 1¾ cents per coach-mile. The cost per coach-mile stated above (19.21 cents) does not include interest on investment.

The rate of fare charged since the inauguration of the service is 10 cents per passenger. Transfers are not given from one coach route to another, nor are they interchanged between coaches and street railway cars. No free passengers are carried. All coaches are one-man coaches, seating twenty-five passengers and are equipped with Johnson registering fare boxes.

The operating trip sheet in use is similar to the one used by the North Shore Company, and shows: date, run number, coach number, leaving and starting points, etc., speedometer readings, fare-box readings, number of passengers carried and amount of revenue. Daily reports are made to the proper department heads and officials, showing passenger earnings, coach-miles operated, earnings per coach-mile, and timetable cost.

The classification of accounts which we are using is based on the Interstate Commerce Commission's classification for electric railways and is similar to that adopted by the American Electric Railway Association at Atlantic City in October, 1923.

Oklahoma Association Meets

NEARLY 600 representatives of the four branches of the public utility industry gathered for the sixth annual convention of the Oklahoma Utility Association in Oklahoma City, beginning March 11 and continuing three days. Some twenty speakers were on the program.

The interference of motor bus lines with the legitimate operation of railways was discussed by John Shartel, president Oklahoma Railway Company, and A. S. Johnson of the M. K. & T. R.R. Both pointed out that bus lines are not compelled to stand on the same basis as other transportation. The railroads are allowed to earn only 5¾ per cent on their investment and are required to pay heavy taxes, while bus lines make use of the highways paid for by the people, without having to help adequately to support the highways.

Mr. Shartel characterized the growing use of the private automobile as "a social stampede that would stop no one knows where." He said that of 26,000 automobile owners in Oklahoma City 3,000 paid income tax last year.

Mayor O. A. Cargill of Oklahoma City, who studied law while a street car motorman and a traffic policeman in Oklahoma City, welcomed the convention. He declared that municipal ownership of utilities does not offer the same degree of incentive for effort on the part of those responsible for its administration as comes with private ownership.

At the banquet Wednesday night Governor M. E. Trapp was the guest of honor and was told that the business world now has confidence in the capacity and integrity of the state government in Oklahoma.

Clarence E. Rentchler, a lineman of the Oklahoma Gas & Electric Company, was awarded an Insull medal for saving the life of a fellow lineman.

Special Trackwork

THE sectional committee of the American Engineering Standards Committee on specifications for special trackwork materials and design of 7-in. plain girder rails held its fourth meeting at A.E.R.A. headquarters, New York, on Feb. 28. Those present were V. Angerer, chairman; C. A. Alden, E. B. Entwisle, H. H. George, R. E. Hess (representing Messrs. Young and Kenney), F. Newman, E. P. Roundey, E. M. T. Ryder and J. B. Strong.

For sub-committee No. 1 Mr. George reported that he had submitted its report to the committee on way matters of the A.E.R.E.A.

In the absence of Chairman R. C. Cram of sub-committee No. 2 Mr. Roundey read the report, covering proposed specifications for standard section rails, girder groove, plain girder and girder guard rails. This report developed considerable discussion, particularly as to the matter of adoption of certain specifications in which a number of changes of minor importance were being considered.

Mr. Hess read the report of subcommittee No. 3 for Mr. Young, submitting manufacturers' standard specifications for rolled manganese steel rails, specifications for manganese steel in castings for trackwork, specifications for general steel castings, specifications for hard steel castings for trackwork, specifications for gray iron castings for parts other than bodies of track castings and also for bodies of track castings, specifications for malleable castings. He also read a letter from Enrique Touceda, consulting engineer of the American Malleable Castings Association, pointing out the objections to specifying two grades of malleable castings. It was decided to recommend one grade only, that standard with the American Society for Testing Materials.

Some discussion also insued on the various specifications, a number of suggested minor changes being considered. It was decided to obtain tentative agreement on such changes before submitting them to the different associations interested.

The next meeting of the committee will be held at New York on April 23.

American Association News

Power Transmission and Distribution

A TWO-DAY meeting of the power transmission and distribution committee of the American Electric Railway Engineering Association was held March 10 and 11, in the offices of the Chicago Rapid Transit Company. The first day was devoted to sub-committee meetings, reports of subcommittees being presented at the general session.

The subcommittee on concrete poles presented a tentative specification for the construction of concrete poles. The subcommittee proposes to have Prof. D. D. Ewing check a portion of the existing specification in section D S 3c of the Engineering Manual, which is to be revised, to determine if it conforms with present day practice.

Considerable information is being collected by the subcommittee on dimensions of approach gears, with a view toward standardization.

Consideration was given to the subject of current collectors with the result that the entire committee instructed a subcommittee on the subject to coordinate with that on car equipment.

Another subject discussed at some length was the matter of a trolley support in storage yards. This was provoked by the recent proposed rules on fire protection tentatively set up by another committee of the Engineering Association. It was felt that a set of rules should be adopted with which a majority of the companies will comply. These same rules to comply with the American Fire Protective Association code. It was suggested that a subcommittee be formed to crystallize the power transmission and distribution committee's ideas on this subject.

Progress reports were presented by the various subcommittees.

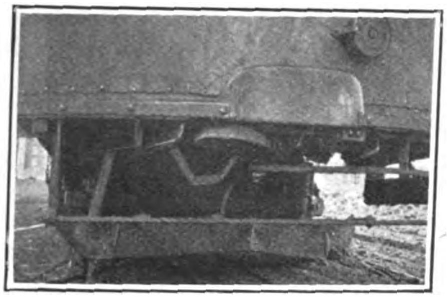
During the meeting, H. A. Johnson, president of the Engineering Association congratulated the committee on its attendance, and explained the effort being made on the part of that association to co-ordinate the work of the various committees.

The following members were present: Chas. H. Jones, chairman; J. Walter Allen, Robert L. Allen, S. M. Day, T. H. Drew, Leslie E. Delf, D. D. Ewing, Charles Gilman, H. W. Griffin, C. L. Hancock, C. J. Hixson, A. Hughes, Jr., John Leisenring, F. McVittie, H. S. Murphy, Carl P. Nachod, J. F. Neild, H. A. Pharo, W. J. Quinn, W. Schaake, A. Schlesinger and F. J. White. D. L. Smith, D. H. Huttleston, D. A. Tomlinson, W. L. McDaniels, Sam Johnson, John Stephenson, Cæsar Antoniono, G. I. Wright, H. A. Johnson, L. W. Birch, Charles Gordon and M. B. Knox were present as guests.

Maintenance of Equipment

Simple Snow Scraper Used at Holyoke

THE city of Holyoke, Mass., has frequent heavy snow storms during the winter. An ample number of snow sweepers and plows enables the Holyoke Street Railway to keep its lines open during most severe storms. In order to obviate the necessity of using the sweepers for light snow storms, however, the company has equipped its cars with home-made scrapers of the type show in the accompanying illustration. They consist of a metal piece bent to the circumference of a large circle and slightly greater in length than the width of the track. This is mounted on a simple framework which is hinged at the front end and may be raised or lowered by means of a lever located on the platform alongside the motorman.



The Scraper Successfully Handles Light Snow and Saves the Use of Plows and Sweepers

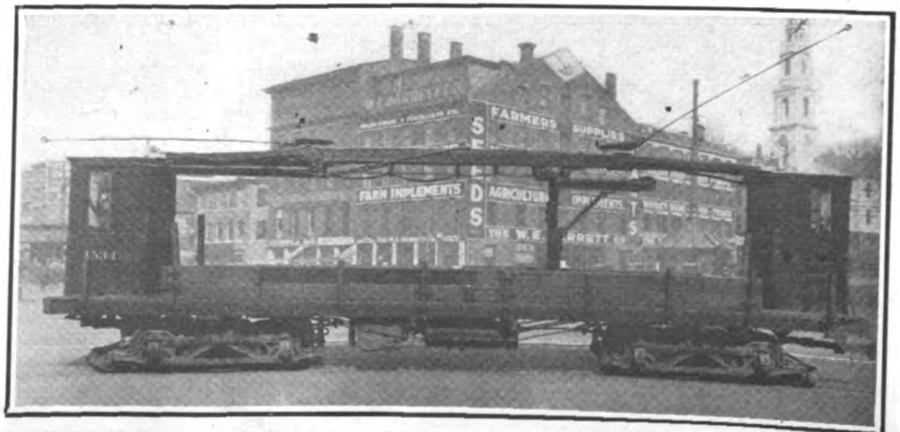
Maintaining Aluminum Cell Lightning Arresters

THE Northern Indiana Power Company, Kokomo, Ind., has thirty-five General Electric direct-current aluminum lightning arresters in service on its cars. These are of the standard two-cell type and are installed outside, either under the car or on the roof.

The company's practice in maintaining these arresters is to remove them from the cars at the beginning of winter. The electrolyte and oil are thrown away, the jars and plates are washed thoroughly and the arresters are then stored in a dry, warm place. When they are again returned to service in the spring, new electrolyte and oil are used. During the summer months the arresters are inspected once a month and the fuses are inspected after each lightning storm. This work is done by the pit men. Excellent results have been obtained from this method, and within a year's time the company has used but two new cells and one set of plates for replacement on thirty-five arresters. No failures have occurred due to lightning while in service during this period.

Air Hoist Used on Work Car

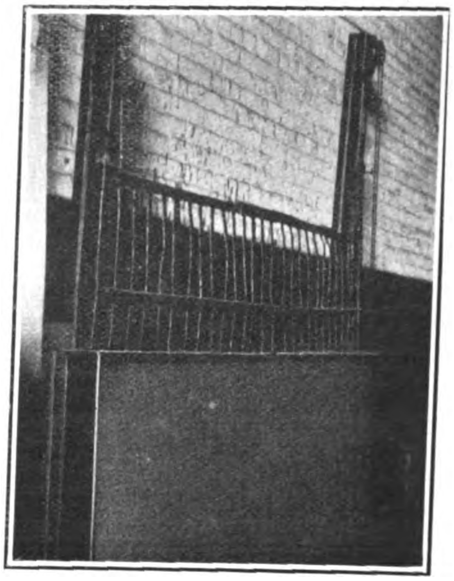
AN UNUSUAL type of derrick car has been constructed by the United Electric Railways, Providence. Between the motorman's cabs at the two ends of an ordinary flat car a horizontal beam has been placed about 7 ft. above the floor. The two trolley poles are attached to the upper side of this beam. From the under side of the beam is suspended an ordinary air hoist, such as is used for handling materials in repair shops. This has been laid flat along the underside of beam and from the end of the hoist a chain with a hook runs over a series of pulleys and to a rotating derrick arm. The arrangement is shown in the accompanying illustration. The hoist is attached to the air system of the car and by the operation of a valve the power of the pneumatic hoist is used for lifting objects at the end of the derrick boom.



A Compressed Air Hoist Suspended from the Center Beam Does the Lifting Work of This Derrick Car

Fender Dipping Tank Does Painting Cheaply

THE steel fenders used by the Union Street Railway, New Bedford, are painted very cheaply by a dipping process. A tank of comparatively small capacity has been built slightly larger than the fender. This is filled two-thirds full of water and one-third of paint on top of the water. The fender is lowered by means of an arrangement of light pulleys and ropes down through the paint into the water and then lifted out again and allowed to drip. The apparatus used in this process is shown in the accompanying illustration.

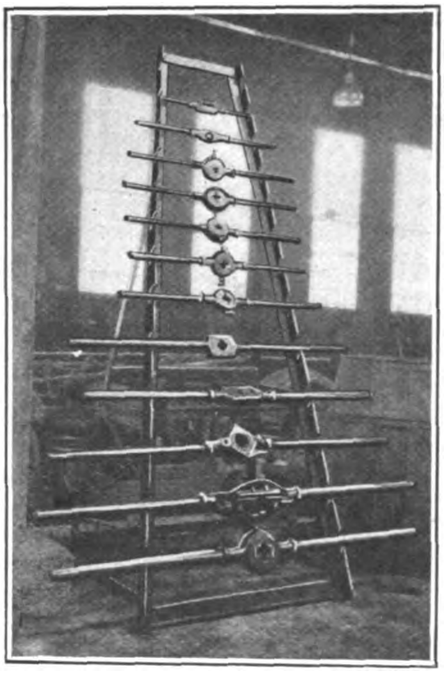


Dipping Tank for Fenders

Handy Die Stock Rack

DIE stocks of various sizes are common tools about electric railway shops and it is convenient to keep these together with an arrangement for easy selection. A rack for die stocks which has been found particularly convenient is shown in the accompanying illustration. It is in use in the shop of the Philadelphia & Western Railway, Norristown, Pa.

The front pieces of the rack which support the stocks are made of 1½-in. angles and the distance between these decreases as the height from the floor increases in order to provide for different lengths of the stock handles. Slots are cut in one of the flanges of the angles to receive and support the stocks. These are sloped slightly so that there is no danger of the stocks rolling out when once they are placed in position. The back supports for the rack are of 1-in. angles and the framework is strengthened and supported by the use of flat straps. A front strap 1¾ in. wide and end straps 1¼ in. wide are used. The rack is 67 in. high, 29 in. wide at the base and 23 in. deep. The width at the top is 12 in. Provision is made for holding thirteen stocks.



Die Stocks Are Kept Convenient to the Work in This Rack

In order to provide a storage space for the dies, a shelf is included in the rack. This is 12 in. x 22 in. and is made of sheet iron. This shelf is 23 in. from the floor.

New Equipment Available

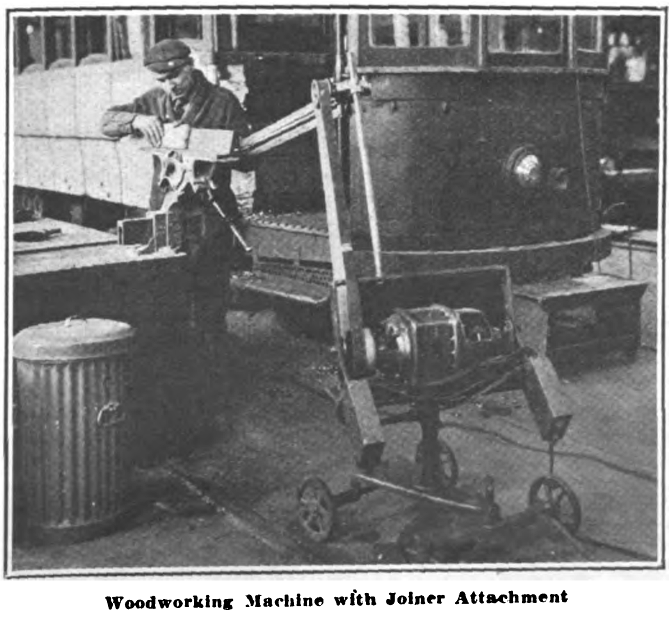
Making Woodworking Repairs on the Job

REPAIRS to electric railway cars usually entail a large amount of hand work. In order to meet this condition the P. L. Billingsley Company is marketing the Flexway woodworking machine. The work done by one of these machines comprises boring, ripping, cutting off, ploughing, splining, etc.

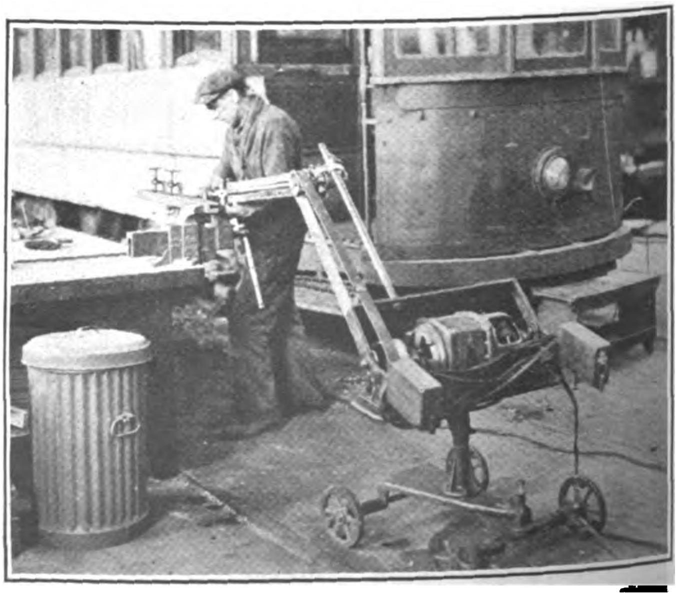
The machine combines many of the features of the mill and is portable, well balanced and flexible so that it can be taken to the job for any class of framing operation required. It is made in four sizes, the No. 1 size being adapted to lumber up to 2-in. thickness, the No. 2 to lumber up to 4-in. thickness, the No. 3 for lumber up to 6-in. thickness and the No. 4 is built to order for work on timbers of any dimensions. The No. 2 size is particularly adapted for the class of work necessary in repairing car bodies in electric railway shops. Used with different attachments, it is a router, a bench joiner, a gainer, a boring and counter sinking machine or a saw for cutting off or ripping lumber. Emery and buffing wheels can also be used as well as saws. The chassis is mounted on roller bearings and the center swivel post on ball bearings. The weights are adjustable so as to allow the operator to "tune" the machine to suit himself. The sawing head is adjustable to cut at any angle up to and including 55 deg., making it a convenient tool for various repair operations. Accompanying illustrations show this machine with a mortising attachment and also with a joiner attachment in use in the shops of the United Railways & Electric Company, Baltimore, Md.

Combination Tractor and Rail Truck

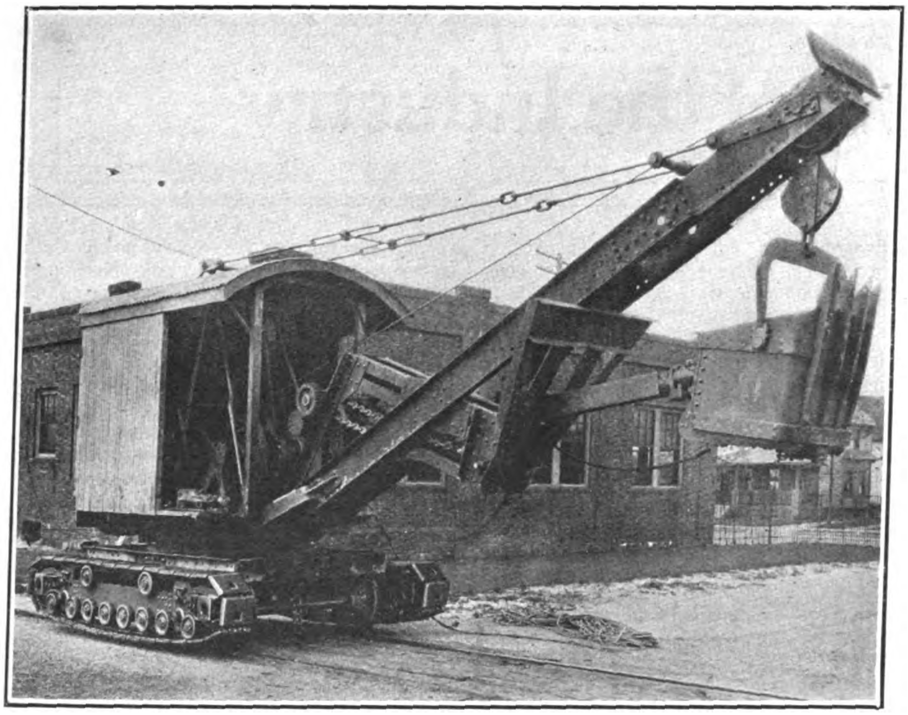
IN ORDER to provide a mobile unit that can be operated either on the rails or off, the Differential Steel Car Company, Findlay, Ohio, has developed a combination car-wheel truck and tractor. A machine that can operate on rails is of great advantage in getting to the job, as with the tractor treads alone movement over long distance is slow and



Woodworking Machine with Joiner Attachment



Shaping a Piece with Mortising Attachment



New Propelling Unit for Electric Shovel or Other Field Machine Is Equipped for Tractor Operation or to Run on Rails

costly. When once on the job tractor mounting is most convenient.

The equipment on the upper part of the car body can be anything desired, and the operating part can be fitted to concrete mixers, power shovels or other equipment. When applied to a shovel continuous digging is made possible and the time of shifting the shovel is reduced. The shovel can also advance while digging, which is a further advantage. The tractor mounting eliminates the need for mats used to support the shovel, and no blocking is required to maintain its position while digging as is required with wheel mounting.

The change in arrangements from the position of running on the tractor treads to the car-wheel operation, or vice versa, is effected by removing four nuts and filler blocks and replacing them so as to raise or lower the car wheels and bring them into contact with the rails, or raise them above the bottom of the tractor treads.

With the car running on rails, the change is made to the tractor treads by running the car wheels on wedge blocks, so as to raise the whole machine. By removing the four filler blocks above the axle, the tractor treads come down to their lowest position. Then by replacing the filler blocks beneath the axle, the equipment is ready to travel on the tractor treads. To make the reverse change, it is only necessary to reverse this operation.

The equipment is steered when traveling on the tractor treads by means of clutches of the multiple-tooth type, and either tread may be locked while the other is driven. The width varies according to the type of shovel, and whether the journal bearings are located inside or outside the wheels. The extreme width is from 7 ft. 7 in. to 8 ft. 8 in.

Improved Journal Truing and Axle Lathe

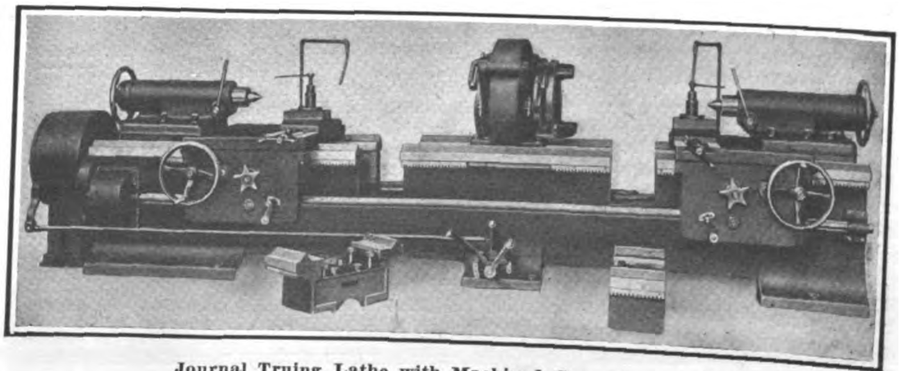
A COMBINATION journal truing and axle lathe has been developed by the Consolidated Machine Tool Corporation of America, Rochester, N. Y. This lathe is provided with two carriages, so that a pair of journals with wheels mounted may be turned at one time. The machine has a headstock of the opening type located in the center of the machine, and the bed has gaps for swinging wheels up to 45 in. diameter. When used as a journal truing lathe, the two carriages turn the journals with the wheels mounted, thereby obviating the necessity of forcing the wheels off the axle and pressing them on again. This naturally results in a considerable saving of time.

The large driving gear is made in two halves with a coarse pitch and wide face teeth. It rotates in two large bronze bearings, of which there is one on either side of the center. The pinion meshing with this gear runs in oil and is mounted on a heavy shaft located in the center of the bed and is driven from the speed change gears located in the left hand end of the bed.

The gaps in the bed of the lathe are machined and finished filler blocks are furnished, which when inserted in the gaps give the carriage full travel between the driving head and the end of the machine, so that regular axle turning, when the wheel and gear seats and journal fits are to be machined, can be handled with economy. With the filler blocks inserted, the carriages have a full bearing on the bed at all times.

This lathe has a 27-in. swing over the bed so that it will accommodate a gear of the ordinary size used by electric railways mounted on the axle. Should the gear run a little larger than this dimension, it is possible to take care of this by raising the tailstock, center driving head, and tool rest a sufficient distance to swing the larger diameter gear over the bed.

Some of the users of this type of lathe are obtaining an average production of two sets of axles per hour with four journals. This production of course greatly exceeds what could be obtained if wheels were pressed off the axles and the journals turned on an axle lathe or a standard engine lathe, and the wheels then pressed on the axle again with a wheel press. Also the pressing off of the wheels destroys the tight fit to a certain extent.



Journal Truing Lathe with Machined Gaps for Wheels

The News of the Industry

Mayor Hylan Makes His Annual Plea: "Leave It to Me"

Mayor Hylan of New York on March 12 appeared at a joint hearing before the Senate and Assembly committees on public service and demanded that the Legislature enact his home rule transportation and public utilities bills, including one which would give legal sanction to the city for going into the bus business.

He assailed the Republican bill, which would give to New York an absolutely free hand in transit on the only condition that municipal operations be made self-sustaining. He characterized this as a measure presented to help the "traction ring."

On the other hand the Mayor made a special plea for his bus bill and renewed his pledge that with the legislation he demanded enacted he would bring about decided improvements in the New York City transit situation within sixty days after such facilities existed.

The delegation which came to speak against the bill was headed by William McCarroll, former Public Service Commissioner. Other opposition was presented by representatives of the chambers of commerce, Citizens' Union and New York Electric Railway Association.

Staten Island Electrification Advocated

Plans for the electrification of the Staten Island Rapid Transit Railway as outlined briefly in the ELECTRIC RAILWAY JOURNAL for Feb. 9, 1924, page 228, received the unanimous approval of twenty Staten Island civic organizations at a hearing before the New York Public Service Commission, March 11. Chairman William A. Prendergast of the commission, who presided, announced that the report of that body on the railway's plan will be issued within the next two weeks.

Appointment of Daniel L. Turner Recommended at Pittsburgh

The special committee appointed by the City Council of Pittsburgh to formulate a plan of procedure as to the construction of a subway and other related questions submitted its final report to the councilmanic public works committee on March 4. The committee recommends the appointment of Daniel L. Turner, New York City, to serve as consulting engineer in charge of studies relating to traffic and transportation in Pittsburgh.

As to the appointment of an advisory commission to serve under Mr. Turner, the committee recommended that this commission be composed of five members, each one of whom shall represent one or more organizations in the city. The committee also suggests that the necessary funds and forces to enable Mr. Turner to carry on the work assigned to him can be provided for by Council after Mr. Turner has had an opportunity to form an opinion as to his requirements.

$110,000,000 for Subways

New York Commission Indicates It Is Ready to Advertise Bids for New Construction

Steps were taken on March 11 by the New York Transit Commission to bring about the speedy beginning of the construction of the Brooklyn crosstown and Washington Heights subways. On that day the Transit Commission formally notified the Board of Estimate that it was ready to proceed with such construction and requested that the board appropriate $110,000,000, the estimated cost, either directly or by reserving that amount out of the city's borrowing margin.

Both bodies have approved the routes of both subways, except for one section in Brooklyn, for which the commission has presented alternative routes in Fulton Street and Lafayette Avenue and has expressed its willingness to accept either route the board may select.

The commission's letter to the board was signed by George McAneny, chairman. It announces that the commission is ready to advertise at once for bids on the first section of the Brooklyn crosstown subway, and will be ready to advertise for bids on many other sections in June and July. In view of agreement with the board's transit committee on every point that had been in dispute between the board and the commission, the members of the commission expressed the view that there was no reason why the board should not begin to "say it with shovels" this spring, and that there was an excellent prospect of going on with the rest of the commission's program for the construction of new subways.

The length and estimated cost of construction of the new routes are given in the accompanying table.

MAIN BROOKLYN CROSSTOWN LINE	Length in Feet	Estimated Cost
Construction		$22,600,000
Station finish		1,400,000
Trackwork		620,000
Total	28,620	$24,620,000
THE FULTON STREET LINE		
Construction		$3,600,000
Station finish		350,000
Trackwork		200,000
Total	10,550	$9,150,000
THE LAFAYETTE AVENUE ALTERNATIVE		
Construction		$6,350,000
Station finish		250,000
Trackwork		175,000
Total	9,300	$6,775,000
WEST SIDE LINE—NORTH OF 59TH ST.		
Construction		$42,200,000
Station finish		1,000,000
Trackwork		1,000,000
Total	33,865	$44,200,000
WEST SIDE LINE EXTENSIONS, SOUTH		
Construction		$10,000,000
Station finish		480,000
Trackwork		340,000
Total	10,900	$10,820,000
Grand total	93,235	$95,565,000

Long-Term Trackless Franchise at Rochester

The Common Council of Rochester, N. Y., on March 11 approved the franchise for the operation of the crosstown trackless trolley line for a period of twenty-five years. This line is operated by the Rochester Railways Coordinated Bus Lines, Inc., a subsidiary of the New York State Railways. The franchise includes transfer privileges to all city bus and trolley lines.

The trackless line was started on Nov. 1, 1923, and has won popular approval. It connects the large industrial and residential sections on either side of the Genesee River, via the Driving Park Avenue bridge.

Recommendations for Rapid Transit in Detroit

Col. Sidney D. Waldon, chairman of the Detroit Rapid Transit Commission, commented recently on the situation there. He said that the rapid transit studies there indicate that the comprehensive system for Detroit ultimately will include occupancy of the so-called Dix-High-Waterloo thoroughfare or a similar combination of streets in about the same locality. The recommendation is made that the thoroughfare be condemned and widened to 106 ft. or 120 ft. to permit the construction of a four-track rapid transit line beneath the right-of-way. The fact that there must be crosstown lines to relieve congestion at the center of the city is emphasized by Major John P. Hallihan, transit engineer in charge of the rapid transit studies for the city, in a supplementary report to acting Mayor Martin.

The following recommendations are summarized from Major Hallihan's report:

1. There should be a crosstown avenue in about the location of the proposed Dix-High-Waterloo route.

2. Sections of the Dix-High-Waterloo route offer certain advantages in connection with outside thoroughfares that make those sections of much greater importance today than when the route was originally laid out.

3. Any main crosstown thoroughfare now or hereafter adopted should be, first of all, continuous; should avoid all offsets, sharp turns and bad alignments; should directly cross and not occupy other thoroughfares, and should have a minimum width of 106 ft., and preferably 120 feet.

4. The width of 80 ft. now considered for Dix-High-Waterloo is insufficient along certain sections, notably the one from Michigan eastward across Woodward to Gratiot Avenue, and should be increased to 106 ft. or preferably, 120 ft.

$600 in Prizes for Ideas on Sound Public Relations

Six hundred dollars in prizes is being offered by *Forbes Magazine* for articles on "How Sound Public Relations Between Public Utilities and Communities Can Best Be Developed and Maintained." For the best articles the following cash prizes will be awarded: First prize, $300; second prize, $200; third prize, $100. By "best" article *Forbes* does not mean the best from the standpoint of literary excellence, but the best in the reasons and ideas presented on the subject. Ideas should be based on present and past experience. The contest closes on May 1. The awards will be announced by the magazine in the issue of May 24. The manuscripts will be passed upon by B. C. Forbes and two other judges representing the National Electric Light Association.

City Councils of Virginia Still Have Jurisdiction

The third attempt to remove the bus and general transportation business from the jurisdiction of city councils in Virginia has failed. In other words, the General Assembly has adjourned without acting on a bill giving the courts of record the right to reverse decisions of city councils in matters pertaining to competition in transportation on city streets.

The bill was so drawn as to give the court the right to cancel any franchise or other agreement if the court found that a city council had granted a new transportation concern the right to operate in competition with an old one in territory where the facilities offered by the senior line were adequate.

The measure was introduced late in the session. It took the place of two other bills somewhat similar in substance which were defeated. The third bill appeared at one time to be likely to pass, having been favorably reported.

Georgia Railway Can't Meet Wage Demands, Says Arkwright

Final arguments in the hearing for higher wages for employees of the Georgia Railway & Power Company, Atlanta, Ga., were presented to the board of arbitration in its last public meeting at the Fulton County Court House on March 6. Edward McMorrow, a member of the executive board of the Amalgamated Association, made the closing plea for the workers.

Preston S. Arkwright was the principal witness for the company. He stated that the company was not able to meet the new demands as it had been when the war labor board adjusted the Atlanta wage scale in 1918, and that any increase in wages must fall directly upon the public which uses the cars. He asserted that financially the company was not in a position even to consider the merits of the appeal for more wages.

Kansas Courts to Be Permitted to Interpret Law Prohibiting Strikes

The provision of the Kansas Industrial Relations Court act which prohibited strikes by coal miners must stand or fall on the decision of the Kansas courts. This the Supreme Court held on March 10 in the case of August Dorchy. The decision of the lower court was reversed.

Justice Brandeis, delivering the opinion, said the Supreme Court could, if it desired, pass upon the validity of the section in question, but that it would rather leave that point to the State courts, and would accept their decision. He declared that the lower courts should not have passed upon the question.

The case arose out of the soft coal strike. The union officials convicted of calling a strike contended that a state could not arbitrarily declare any particular industry to be an essential one.

It will be recalled that in the famous Wolff Packing Company case the United States Supreme Court passed upon the constitutionality of certain parts of the Kansas Industrial Court act, but it does not appear that the State court passed upon the question whether Section 19 (the one under attack), being an ultimate part of the system of compulsory arbitration held to be invalid, falls with it. Justice Brandeis says that in order that the State courts may pass upon this question, its judgment in this case, which was rendered before our decision in the Wolff Packing Company case, should be vacated.

To accomplish that end the judgment of the State Supreme Court was reversed. It was explained that this reversal was largely a technical proceeding, however, designed merely to permit the Kansas Supreme Court again to pass on Section 19, taking into consideration this time the principles laid down by the United States Supreme Court in the Wolff case.

Fellowship in Transportation Offered at Yale

The Graduate School of Yale University announces that the Strathcona Memorial Fellowship in Transportation, of $1,000, is offered annually for advanced work in transportation, with special reference to the construction, equipment and operation of railroads, the problems connected with the efficient transportation of passengers and freight and the financial and legislative questions involved. The holder of the fellowship must be a man who has obtained his first degree from an institution of high standing. In making the award, preference is given in accordance with the will of Lord Strathcona to such persons or to sons of such persons as have been, for at least two years, connected in some manner with the railways of the Northwest.

Applications for this fellowship should be addressed to the dean of the graduate school of Yale University, New Haven, Conn., before May 1, on blanks which may be obtained from the dean, and should be accompanied by a statement of the applicant's education and practical experience, a statement of the particular field of interest to the applicant and his reasons and purposes for desiring the fellowship, letters of recommendation and reprints of articles or publications by the applicant.

Kewanee Public Utilities Service Company Incorporated

The Kewanee Public Utilities Service Company, Kewanee, Ill., has been incorporated with the idea in mind of operating the Kewanee & Galva Electric Railway, the Kewanee Street Railway and the gas and electric plants in Kewanee. B. F. Lyons of Beloit, Wis., is president of the corporation. Mr. Lyons has already submitted a proposition to the City Council of Kewanee to take over the utilities mentioned. Reference to his plan for reclaiming the railway was made in the ELECTRIC RAILWAY JOURNAL, issue of March 1.

Wage Request of Capital Traction Employees Denied

Trainmen and bus operators of the Capital Traction Company, Washington, D. C., have been denied a wage increase from 56 cents to 70 cents an hour. All other employees were refused the 25 per cent advance sought. Arbitration is the next step. The present agreement has two more years to run, but provision is made whereby the schedule may be considered at the end of each year. When the agreement now in existence was signed last March it gave motormen and conductors 50 cents an hour for the first year, 52 cents an hour for the second year, 54 cents for the third year and 56 cents thereafter.

John H. Cookman, secretary of the Amalgamated union, in making known the application for an increase cited the increase in the cost of living since the last wage advance. In announcing the rejection of the petition by the company, George E. Hamilton, president, said that he did not believe any increase in wages was justified under present conditions and that conferences to discuss such increase would achieve no useful purpose.

Wages Advanced Two and One-Half Cents in Augusta

A compromise wage scale granting the trainmen of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., an increase of 2½ cents an hour was agreed to recently by the board of arbitrators. The men had asked for a 5-cent advance. The new scale is effective as of Jan. 1, 1924.

According to the new agreement trainmen operating one-man cars, who received a voluntary increase of 5 cents an hour when placed in charge of the new cars, will now receive 52½ cents an hour instead of 45 cents. The company, it was stated, voluntarily increased its trainmen who were placed in charge of the new cars, for it was realized that the operation of the one-man cars would call for more strenuous labor. The scale was consequently increased from 45 to 50 cents an hour. The operators of the old cars requiring both motorman and conductor were retained on the 45-cent scale.

Plan Joint Station of "L" and Pennsylvania Railroad

Plans for connecting the New York division of the Pennsylvania Railroad with the Frankford Elevated Railway at Harrowgate were discussed recently by Pennsylvania Railroad officials and representatives of business organizations in the northeast section of Philadelphia. The business men outlined a plan to replace the present Frankford Junction station with a new structure at Kensington Avenue, thereby virtually linking the Pennsylvania's New York passenger traffic with the Frankford Elevated Railway. Vice-president C. S. Krick of the Pennsylvania Railroad said this would be expensive and difficult to do. A more practicable plan, he explained, would be to have the proposed new station at or near Erie Avenue, and to connect it with the Frankford "L" by a sidewalk for passengers.

"Co-ordinated Transportation" in New Jersey Explained

How the street cars and the buses can be hitched together to give a co-ordinated transportation service is told by the Public Service Railway, Newark, N. J., in a pamphlet called "Street Cars and Buses." The pamphlet is being mailed direct to the patrons of the railway. On a separate card attached to the pamphlet the company solicits the customer's support if the plan seems favorable to him. The patrons are urged to read the pamphlet carefully so that they will know how the company proposes to operate both agencies of transportation in co-operation, what the benefits will be to the public and the present evils that will be eliminated. The company says that "co-ordinated transportation buses would not use the public street for a garage, and would maintain schedule and headways that would relieve, instead of increase, congestion." The pamphlet illustrates the lesson of the inconvenience and congestion caused by competition and contrasts by means of pictures the difference when co-ordinated service is established.

Opponents of Elevated Construction Win in New York

An agreement has been reached by the New York Transit Commission and the Brooklyn-Manhattan Transit Corporation which will end the long dispute regarding the Fourteenth Street-Eastern District rapid transit line and the elevating of the tracks in the Bushwick section of Brooklyn. Instead of having that portion of the line east of Montrose Avenue elevated the line will be continued as a subway, thereby conforming with the request of Brooklyn citizens. The Transit Commission on March 11 approved the modification of the plans and has submitted them to the Board of Estimate and Apportionment.

The Board of Estimate, in approving the route some time ago, voted against an elevated structure from Montrose Avenue to the present elevated structure at East New York, but the subway officials, claiming to be held by the terms of contract No. 4, refused to accept a subway in lieu of the elevated line specified in the contract.

The first portion of the new line, from Fourteenth Street and Sixth Avenue to Montrose Avenue in Brooklyn, is expected to be ready for operation during the summer.

Paving Relief Measure Defeated

So far as the passing of new bills is concerned the session of the New Jersey Legislature is at an end. In the discussion during the closing hours the Thompson bill was defeated in the House. The intent of this measure was to permit municipalities to relieve the electric railways of all or any part of the cost of paving and keeping in repair pavements between street railway tracks and within 18 in. on either side. Three bills were passed that had been introduced by Senator Smith allowing the Board of Public Utility Commissioners to specify the date on which orders should become effective and increasing and clarifying the power of the board to order a resumption of service discontinued through suspensions.

$491,000 Spent in Des Moines—Facts Advertised Widely

The Des Moines City Railway completed during 1923 a remarkable program of construction and betterment. In its entirety the year's program contemplated an expenditure of $665,470. This was all accomplished with the exception of the failure to complete the Crocker Street line and the non-arrival of the new car bodies which had been counted upon during the late months of the year. This brought the actual expenditures in new capital down to $491,090.

With its idea of placing all available information before the car-riding public the company has recently been using half-page advertisements to tell just what the expenditures for construction and equipment covered.

In the advertisements the figures were given in detail. Recapitulated by departments they were as follows:

Total way and structures		$343,978
Equipment		238,550
Power		82,942
Grand total		665,470
Deduct		
Uncompleted work Crocker line	$78,430	
New car bodies not received	95,950	
		$174,380
Net expenditure of new capital		$491,090

The new car bodies are expected soon. They will be mounted on the trucks and will be put in service as rapidly as possible.

While this major construction program was under way 30,000,000 passengers were carried. Another important work of the year was the quiet, consistent campaign in the interest of customer ownership. This resulted in the addition of more than 400 stockholders. The offering consisted of an issue of $750,000 of 7 per cent preferred stock. A special effort was made to attract small investors.

Louisville Motorman Shot by Automobile Bandits

Dan Criswell, as he was affectionately known to all of the boys on the Chestnut Street line of the Louisville Railway and to many others, was shot and fatally injured by automobile bandits at Madison and Forty-second Streets at 1:30 o'clock Saturday morning, Feb. 23.

Two men boarded Dan's car at the end of the line for the return trip into town. Before Dan had time to start the car one of the men commanded him to wait for the third man. At the same time, the second man told him to stick his hands up, and before Dan had time to turn, shot him through the back. Although suffering from a bullet through the body, just below the heart, Dan started his car after the bandits and fired twice through the car window, the hold-up men returning the fire, which punctured several car windows. Dan fell exhausted after pursuing the men half a block. He was discovered by two automobile drivers and the crew of a westbound car, and they removed him to SS. Mary and Elizabeth Hospital. At 11 o'clock that night Dan passed away. He leaves a widow and five children.

To increase the probability of capture of the assailants the company has offered a reward of $1,000.

In addition to the above reward, C. T. Wingate, conductor at Twenty-fifth and Market carhouse, recently elected a director of the company to represent the employees on the board, together with some of his co-workers, are circulating a subscription list with the intent of offering a separate additional award.

Bus and Subway Bills Introduced in Philadelphia

Ordinances were introduced in the City Council at Philadelphia, Pa., on March 6 appropriating $44,213,647 for the Broad Street subway. At the same session Councilman Apt introduced a new bus franchise bill, which would require the Rural Transit Company, a subsidiary of the Philadelphia Rapid Transit Company, to pay the city annually 5 per cent of its gross receipts, after July, 1927. Both these ordinances were referred to the Council's committee on transportation. The Broad Street subway ordinances were sent to the Council by Mayor Kendrick with a communication of Director Ehlers of the Department of City Transit and a brief message from the Mayor, requesting favorable consideration for these ordinances.

Another measure introduced authorized the transit department to contract for what is known as Step No. 1 in the transit plans. This includes the Broad Street subway, with its connecting line running on Ridge Avenue.

Michigan Company Hopes to Use Truck as Feeder

F. W. Brown, general superintendent of the Michigan Railroad, has outlined a program which is expected to save the railway considerable money, enable trucking firms to give up long hauls and give the manufacturer, farm producer and other shippers quicker and more economical service.

Mr. Brown now is negotiating with a trucking firm in Detroit doing long distance hauling to eliminate these long trips, which often extend more than 100 miles into the state, and confine the activity of the motor trucks to the towns and cities and to concentrated rural districts.

Under the plan the truck firm would pick up the goods at one end, load them into the cars of the Michigan Railroad and after the interurban had made the haul, say, between Detroit and Grand Rapids, the truck representatives in Grand Rapids would enter the car and distribute the goods.

The Michigan Railroad's part in the shipment would consist merely in sealing the car when the truck firm had loaded it and in delivering that car on the interurban siding at the point of destination. Since all goods under the plan are to be carried in carload lots a shipment of miscellaneous freight would be billed as one item to the truck company instead of in forty or fifty items as is now the case. Instead of having to notify the recipients of freight in each case, the railroad would simply have to notify the truck company that the car had arrived and the company would do the rest, since it is to operate locally in every center from which the Michigan Railroad now ships freight. Among other things this plan would allow the railroad to pursue its natural function, eliminate the bugbear of long hauls for the truck company and lead to more freight business for the railroad. It would be particularly advantageous in the winter when snows often prohibit efficient trucking on the roads. Thus where a truck going from Grand Rapids to Detroit might in winter require several days for the trip the railroad could take a loaded car to Detroit during a single night and the truck feeder could make deliveries the following day, giving twenty-four-hour freight service over a distance of more than 150 miles.

Rerouting and Extensions in Toledo Partly Approved

The Council committee on railroads and telegraphs at Toledo, Ohio, has approved a large part of the general Community Traction Company rerouting and extension plan submitted a week ago by Street Railway Commissioner W. E. Cann. Decision was delayed on the establishment of the double-deck bus line on Collingwood and Madison Avenues, the abandonment of part of the Michigan line, the rerouting of Long Belt and Nebraska-Lagrange lines.

Extensions of the Bancroft line to Ottawa Park, East Broadway line through the New York Central subway, the Cherry line to Fitch, the laying of double track in Summit Street extension and the establishment of the trackless trolley crosstown line were all approved.

The final draft of the plan will be submitted to Council only after a very thorough discussion and attempt to line up all sides to put through the constructive features of the plan.

Quartet Helps Railway Relations

The Inspectors' Quartet of the Louisville Railway recently put on an evening program at the radio broadcasting station, WHAS, of the Louisville *Courier Journal.* The company received 186 letters and telegrams complimenting the quartet. These singing trainmen are the ones who contributed to the banquet entertainment at the Midyear Dinner of the American Electric Railway Association at St. Louis. They have three or four engagements a week in Louisville and it is believed they have unquestionably helped to create a better spirit toward the railway on the part of the local public.

Radio Party on Twenty-fifth Anniversary

The United Railways & Electric Company, Baltimore, Md., celebrated its twenty-fifth anniversary on March 4 by giving a radio birthday party. The United took charge for the evening of Station WEAR of the Baltimore *News* and presented a program entirely by its officers and employees, even the announcing being done by a company man.

It was a most diversified program, including brief talks by President C. D. Emmons and other company personages, band, chorus and solo numbers. That it was enjoyed was testified to by the large number of letters and postcards received by the company from patrons who listened in and who wrote commending the company for its enterprise as well as for a delightful evening's entertainment.

News Notes

Another Urge to Ride in Non-Rush Hours.—Another city is joining the ranks calling attention to shoppers and pleasure seekers to return home in the evening before the usual rush hour crowds. A recent New Orleans editorial writer states that it is impossible to arrange arbitrarily the closing of business hours, but it is possible for women shoppers and pleasure seekers in general, to use the cars in off-rush periods. The editorial suggests to the theater managers one way out of the difficulty by earlier matinees. Instead of their starting at 2:30 as is usual, the writer suggests a 2 o'clock performance, so that the theater patrons might be permitted to reach home before the evening rush hour begins.

Railway Official Subject of Article.—An appreciation of James P. Barnes, president of the Louisville Railway, is contributed by E. F. Kelley to the January number of the *Tech Engineering News.* Mr. Kelley recounts an interesting narrative on an outstanding figure in the electric railway field "through secretary's eyes." This number also includes articles on "Putting Radio to Work" and the "Hydro-Electric Power Plants of California," and treats of other subjects of interest to the engineers.

Working Toward Saving Line.—Efforts are being made to prevent the abandonment of the Meadville-Linesville Line of the Northwestern Electric Service Company of Erie, Pa. To this end a special committee has been appointed representing local civic bodies, it having been announced previously that the line was not a paying venture, that to put it back in proper condition would cost thousands of dollars and that service was likely to be abandoned at any time.

Company Won't Pay for Paving.—Clark V. Wood, president of the Springfield Street Railway, Springfield, Mass., has informed the town of Palmer that the company will not conform to terms calling for the cementing of Main Street in Three Rivers Village, for which $15,000 was appropriated by the town. The company is called upon to pay for the cement between the rails and for 18 in. on either side. Rather than do this, Mr. Wood says the company will discontinue the line running to Three Rivers.

New Interurban Under Consideration.—John H. Carpenter of Florence, Ala., and associates are securing options on right-of-way for an interurban railway from Florence, Ala., to Nashville, Tenn., by way of Mount Pleasant and Franklin, Tenn. The standard gage railroad operated with gasoline from Mount Pleasant to Franklin, Tenn., is owned by John H. Carpenter and the Howard estate. This track will be used as a part of the proposed new interurban line. The line would serve the Wilson Dam district and the Muscle Shoals territory.

$114,505 in Pensions. — During the year 1923 there was paid to employees on the pension list of the Boston Elevated Railways, Boston, Mass., $114,505. Fifty-seven men were added to the list and thirty were taken from the list by death. There are 243 men on the pension roll at the present time.

Seek Wage Advance.—The employees of the Lehigh Valley Transit Company, Easton, Pa., have asked for an increase in pay from 6 cents to 8 cents an hour and changes in working conditions. The three-year men are now being paid 55 cents an hour.

A Real Achievement in Service.—A record of 4,500 years of service is the boast of the Portland Railway, Light & Power Company, Portland, Ore. Inspired with one idea, namely, service to the public, 187 employees of this company have stuck to their cars for a period of twenty years or more of continuous service. Recently these men, members of the Twenty-Year Club, celebrated their loyalty at a dinner at the Chamber of Commerce. Though known as the Twenty-Year Club, some of the men have given forty years of their best efforts to accommodating the company's patrons and co-operating with their company.

Financial and Corporate

Good Showing by Eastern Massachusetts

Gross Revenue Up $100,000—All Fixed Charges and Preferred Dividends Covered

Net income of the Eastern Massachusetts Street Railway, Boston, for the year ended Dec. 31, 1923, after all charges, was $878,583, a decrease of $181,259 over 1922.

According to the annual report presented to the stockholders on March 3 gross receipts from car fares in 1923 were $10,006,150, an increase of $16,422 over similar receipts of the previous year. On Sept. 1, however, the Hyde Park division was taken over by the Boston Elevated with a decrease during the last four months of the year of approximately $17,000 in gross receipts.

COMPARATIVE INCOME OF EASTERN MASSACHUSETTS STREET RAILWAY

Statement of Public Trustees for Years Ended Dec. 31

	1923	1922
Passenger revenue	$10,006,153	$9,989,728
Auto bus revenue	76,389	16,359
Freight and other revenue	46,033	40,107
Rentals, advertising, etc.	233,741	252,892
Interest and other income	350,389	413,578
Total revenue	$10,712,705	$10,712,663
Expenses:		
Way and structures	$1,811,202	$1,879,506
Equipment	1,395,813	1,245,256
Power	1,219,869	1,082,151
Car operation	2,461,327	2,337,343
Injuries and damages	365,093	356,701
Insurance	84,810	162,588
Law expense	15,757	13,546
Rent of tracks	68,521	77,258
General wages and expenses	246,322	247,127
Pensions and group insurance	77,404	33,696
Stationery and printing	41,423	41,984
Stores and garage expenses	104,814	212,777
Miscellaneous expense	51,430	54,673
Auto bus expense	116,729	13,484
Total operating expenses	$8,060,514	$7,758,090
Total operating expenses and taxes	$8,436,019	$8,154,914
Gross income	2,276,686	2,557,749
Interest and rentals	1,398,152	1,497,956
Net income	$878,533	$1,059,792

Operating expenses include charges for depreciation amounting to $848,214 in 1923 and $848,753 in 1922. During the year $509,119 of the reserve was applied to reconstruction and amortization.

Although at the end of June there was an increase over the corresponding period of 1922 of more than $317,000, this gain was almost entirely wiped out by the end of 1923. In no month since June did the passenger revenues of the present year equal those of the corresponding months of 1922. Industrial depression in the shoe and textile centers, increased use of privately owned automobiles and unseasonable weather conditions during the summer and fall all contributed to this result. During the year there have been no material changes in the rates of fares. The average fare is 6.9 cents.

There was a substantial increase in auto bus revenue due to the installation of a larger number of buses. Interest and other income declined more than $63,000, due to the application of large portions of reserve funds and the consequent disposal of securities. Other revenue items did not show material changes from the previous year. Total revenues from all sources for 1923 exceeded those of 1922 by $42.39.

There was an increase of $302,423 in total operating expenses in 1923. Higher wages, an advance in price of fuel oil used for power and extension of auto bus operation account for the major portion. An increase of nearly $44,000 in pensions and group insurance is due to the fact that group insurance for the productive force was in effect during only the last two months of 1922. Way and structures, insurance, and stores and garage expenses show material savings. The item of taxes shows a reduction of about $21,000 due to decrease in net income. A substantial reduction was made in fixed charges.

The comparative expense in track and line was $1,510,182 in 1923 and $1,602,198 in 1922.

Trackwork representing $301,547 was considered to offset depreciation to that amount and additional work costing $190,406 was charged to the "rehabilitation" account. The unexpected balance of the "rehabilitation" fund is $270,548.

Fifty new double-truck passenger cars were ordered in 1923 for delivery in October, but only a few of these were actually received in time to be put in service during the year. They will all be in operation early in 1924. These new cars cost approximately $612,000.

It is expected that by Aug. 1 all routes included in the signal improvement program will be fully equipped. The estimated cost is $200,000.

By an award of a board of arbitration wages of all productive employees, numbering about 2,100, were increased 3½ cents an hour, effective from May 1, 1923, to May 1, 1924. This award increases payrolls about $200,000 per annum.

This company is now regularly operating thirty-one buses which serve in a large degree as feeders to the railway lines. Bus equipment investment for the year was $148,502. This auxiliary service is supplied principally in sparsely settled sections where there are no heavy peak loads such as street railway cars can better handle. Receipts on bus lines naturally are relatively small, and operation for the year shows a loss of about $40,000. The trustees say that even if this feeder system should continue to result in financial loss, providing the loss is not too great to be absorbed by the earnings of the railway district in which the buses are operated, the good will of the public will be adequate compensation.

The dividends started in 1922 on the first preferred and sinking fund stocks were continued in 1923 by the payment of 3 per cent on Feb. 1 and Aug. 1 on these issues. In addition a 6 per cent dividend was paid on preferred B stock on Feb. 1 and 3 per cent on the same stock on Aug. 15. The adjustment stock received 5 per cent in two installments of 2½ per cent each, paid May 15 and Dec. 1. Total dividend payments for the year were $959,852. The trustees also declared dividends of 3 per cent each on the first preferred and preferred B stocks, payable Feb. 1 and Feb. 15, 1924, respectively.

During the year funded obligations of the company to the amount of $1,000,000 were retired and canceled as follows:

Serial bonds due Jan. 1, 1923	$300,000
Serial bonds due Feb. 1, 1923	90,000
Lowell, Lawrence & Haverhill bonds due June 1, 1923	479,000
Bay State equipment trust notes due Aug. 1, 1923	131,000

The company elected not to exercise its option to extend $689,000 of Brockton Street Railway bonds due Oct. 1, 1924, and provision will be made to pay them at maturity.

During the year the city of Boston took by eminent domain that portion of the company known as the Hyde Park Division and leased it to the Boston Elevated Railway for operation. The company was awarded $310,000 for this property, and it secured about $15,000 additional from salvage for power house machinery. This taking resulted in an investment loss to the company of $326,980.

Dividends and Surplus Up on New York State Railways

A comparative statement of the earnings and expenses of the New York State Railways, Rochester, for the years ended Dec. 31, 1923, and 1922, follows:

SUMMARY OF OPERATIONS OF NEW YORK STATE RAILWAYS

	1923	1922
Railway operating revenues	$10,800,517	$10,500,220
Railway operating expenses (including depreciation)	7,708,178	7,687
Net revenue railway operations	$3,092,339	$2,813,203
Net revenue auxiliary operations	2,482	1,544
Net operating revenue	$3,094,821	$2,814,747
Taxes assignable to railway operations	797,122	705,382
Operating income	$2,297,699	$2,109,365
Non-operating income	76,869	97,421
Gross income	$2,374,568	$2,206,786
Deductions from gross income	1,451,177	1,435,517
Net income	$923,391	$771,269
Sinking fund appropriations	34,129	34,740
Dividends preferred stock	(5%) 193,125	(5%) 193,125
Earned on common stock	(3.49%) $696,136	(2.72%) 543,403
Dividends common stock	(2¼%) 448,762	(1½%) 299,175
Surplus	$247,374	$244,228

North Shore's Best Year

$686,864 Net Income Reported for 1923 by Chicago-Milwaukee Line—An Increase of 32.61 per Cent

The year 1923 was the most successful in the history of the Chicago, North Shore & Milwaukee Railroad. Operating revenues increased $937,320, or 18.71 per cent over the year 1922, while the increase in the net income was $168,935, or 32.61 per cent. Gross revenues from freight and merchandise despatch business increased $294,661, or 39.88 per cent.

Participation shareholders met on Feb. 27, 1923, and by unanimous vote adopted the plan previously announced for the financial reorganization of the company. A new corporation was formed under the name of the Chicago, North Shore & Milwaukee Railroad, with an authorized capital stock distributed as follows:

Prior lien 7 per cent cumulative stock...	$10,000,000
Preferred 6 per cent non-cumulative stock	5,000,000
Common stock	5,000,000

All of the preferred and common stock, together with $2,684,208 of five-year, non-interest bearing promissory notes, were delivered to the participation shareholders in exchange for their shares in the proportion provided for in the trust agreement under which the participation shares were issued.

A quarterly dividend of 1½ per cent on the preferred stock was paid Oct. 25 to stockholders of record Oct. 10. Quarterly dividends on the prior lien and preferred stocks were declared payable Jan. 2 to stockholders of record Dec. 17.

COMPARATIVE INCOME ACCOUNT OF NORTH SHORE LINE, INCLUDING OPERATION OF CHICAGO & MILWAUKEE ELECTRIC RAILWAY

Operating revenue:	1923	1922
Passenger and special car revenue	$4,836,531	$4,214,151
Freight and express revenue	1,033,479	738,817
Miscellaneous revenue	75,261	54,983
Total	$5,945,271	$5,007,951
Operating expenses:		
Way and structures	538,588	429,280
Equipment	405,220	342,850
Power	529,480	483,317
Conducting transportation	1,878,229	1,533,246
Traffic	179,504	154,794
General and miscellaneous	933,399	834,104
Total	$4,464,420	$3,777,592
Net revenue—railway operation	$1,480,851	1,230,359
Net auxiliary operating revenue	11,444	8,731
Net revenue from operation	$1,492,295	$1,239,090
Taxes assignable to railway operation	279,448	248,937
Operating income	$1,212,847	990,153
Non-operating income	26,625	14,560
Gross income	1,239,472	1,004,713
Fixed charges	552,608	486,784
Net income	$686,864	$517,929

Under authority of the Illinois Commerce Commission and the Wisconsin Railroad Commission, the company issued $1,500,000 of the new prior lien 7 per cent cumulative stock, partially to reimburse the treasury of the company for capital expenditures made in 1923. The stock is being sold at the par value of $100 a share.

More than two-thirds of this stock has been sold to employees and customers of the company, residents of the territory tributary to the road.

During the year additional equipment was acquired costing $649,000. This was financed through an equipment trust amounting to $557,000, the balance of the purchase price being paid by the company.

To provide funds for additions and betterments $1,000,000 of 6½ per cent three-year secured sinking fund notes were sold. First mortgage bonds to the amount of $902,000 were issued and deposited as part of the security for the notes above mentioned.

Equipment notes amounting to $142,000 were paid during the year and $110,900 secured sinking fund notes were retired.

COMPARATIVE INCOME STATEMENT OF NORTH SHORE LINE, CONTRASTING YEARS 1916 AND 1923

	1916	1923
Operating revenue	$1,157,191	$5,945,272
Operating expenses	714,887	4,464,421
Net revenue—railway operation	442,304	1,480,851
Net auxiliary operating revenue	....	11,444
Net revenue from operation	442,304	1,492,295
Taxes assignable to railway operation	66,038	279,448
Operating income	376,266	1,212,847
Non-operating income	6,208	26,626
Gross income	382,474	1,239,473
Fixed charges	237,996	552,608
Net income	144,478	686,865

It will be recalled that the North Shore Line has the distinction of being the first winner of the Coffin medal, thus adding materially to the value of the award.

Attention is directed in the report to the additions made during the year to the rolling stock equipment.

The record for safe operation was maintained during the year.

Relations between the company and its employees and customers are very satisfactory. The management says there is evidence that the feeling of good will toward the company in the various communities it serves increases year by year.

Offer Made for Ohio Interurban

An offer of $172,500 is understood to have been made in behalf of the Northern Ohio Traction & Light Company for the property of the Cleveland, Alliance & Mahoning Valley Railroad, now in receivership. It had not been intended to announce the offer until after the deal was closed, but the news became public following a meeting of bondholders, at which the offer was announced and a statement made to the bondholders indicating the amount of money it would be necessary for them to furnish in order to continue operation. Bonds to the amount of $1,116,000 are outstanding against the property, and the bondholders are said to be opposed to advancing any new money.

On March 14 confirmation was secured in New York of the statement that the Common Pleas Court of Cleveland had confirmed the purchase of the road by the Northern Ohio Electric Corporation, acting for the Northern Ohio Traction & Light Company. The price was $172,500.

The Cleveland, Alliance & Mahoning Valley Railroad, 45 miles long, runs through Alliance, Ravenna and Warren.

Toledo & Western Sold

Willys-Overland Company and Wabash Buy Line Extending from Toledo to Pioneer

Announcement of the sale of the Toledo & Western Railroad to the Willys-Overland Automobile Company and the Wabash Railroad was made at Toledo recently. As a result the Toledo & Western Railway has been incorporated with a capital of $500,000. John N. Willys is president; J. F. Taussig, president of the Wabash Railroad, executive vice-president; A. B. Qualy, secretary, and J. H. Gerkens, treasurer. The latter officers are both executives at the Willys-Overland plant in Toledo. The new company will spend about $1,000,000 for improvements to the property and in new connections.

The property sold consists of a line from Toledo west to Pioneer, Ohio, and a branch north to Adrian, Mich. The road, in the shape of a "Y," intersects the Wabash railroad at Adrian and at Franklin, a junction point near Alvordton, Ohio. The Willys-Overland company will operate the line largely in the interests of improving its freight-handling facilities. At the present time all its shipments have to be made over the New York Central system. The new Wabash connection will provide another outlet through which shipments can be made on a fast line to the Eastern markets.

More than 300 acres of land were purchased in Toledo to provide a new freight right-of-way into the local plant. Willys also owned an old spur of the Detroit, Toledo & Ironton. This will serve for part of the freight route, which will be only about 2 miles in length from the plant to the Toledo Terminal Railroad and Toledo & Western junction point. The new freight line will open up a big territory for new industries and provide transportation facilities from the automobile plant into a new residence district not supplied with electric traction service at present.

The road has been operated by the Henry L. Doherty interests for thirteen years, the last two under receivership. The receivers have until April 5 to wind up their affairs. It was purchased some months ago by Frank Coates, on behalf of the Doherty interests, for $600,000 at special master's sale. Since the purchase the electric power distributing facilities have been separated from the railroad and grouped under the Toledo Suburban Electric Company, a newly incorporated company. The Toledo & Western property has been operated at only a very slight loss in the last few years.

Merger Bill Appears Again in Washington

The District Commissioners at Washington have sent to Congress for introduction a revised bill designed to bring about a merger of the two local railways and the Potomac Electric Power Company.

The bill considered by the last session of Congress calls for the collection of a certain percentage of any moneys earned by the company in excess of a fair return on valuation. The revised measure changes this to a direct tax of 20 per cent on the operating income without regard to valuation.

The bill relieves the company of paying the salaries of crossing policemen, which amounts to $38,000 a year for the Capital Traction Company and $60,000 for the Washington Railway & Electric Company.

The new bill requires the companies to continue to pay the cost of paving between tracks.

Plan Announced for Readjusting Financial Structure of New Jersey Corporation

Thomas N. McCarter, president of the Public Service Corporation of New Jersey, announced on March 14 a plan for the readjustment of the corporation's financial structure as affecting certain securities and intercompany relations. The plan has already gone before the Board of Public Utility Commissioners. The purpose behind it is to permit the company to meet the requirements of service to the public, to strengthen and improve the position of security holders and to provide an adequate means of procuring new capital for necessary extension and development.

Consummation of the plan will not disturb the relationship which the corporation now bears to its subsidiary companies or to the public; nor will it affect the holders of securities of the underlying electric, gas and railway properties, except to improve their position by facilitating the development of these properties. It will make possible the financing by the corporation itself of the capital requirements of the railway properties until the credit of the railway is re-established, while the electric and gas activities will be placed in position to finance themselves independently.

In general terms the plan provides for a series of financial operations designed to remove the present mortgage restrictions which cramp the capital expansion of the underlying companies and it will at the same time increase the borrowing capacity of the parent corporation.

The details of the plan regarding changes in the outstanding securities, announced briefly, are largely of interest to the holders of the securities of the Public Service Corporation, to whom they are addressed. It does appear of general interest to note that among other things the plan contemplates the consolidation of Public Service Electric Company, Public Service Gas Company, United Electric Company of New Jersey and several smaller companies, practically all of whose stocks are now owned by the Public Service Corporation, into a new company to be known as the Public Service Electric & Gas Company, all of whose common stock will be owned by the Public Service Corporation. Further announcement will be made by the company to the security holders when the precise details of the plan are finally settled. It will be recalled that Mr. McCarter recently announced that the capital requirements of the company this year would be $34,000,000.

$3,000,000 of Boston Elevated Bonds Offered

Harris, Forbes & Company, New York, N. Y., as members of a syndicate are offering for subscription $3,000,000 of Boston Elevated Railway 6 per cent ten-year gold bonds. The bonds are dated June 1, 1923, and are due June 1, 1933. They are in coupon form in denomination of $1,000 each. The issuance of the bonds has been approved by the Department of Public Utilities of Massachusetts. Of the proceeds of the issue $700,000 will be used to reimburse the company for money used to pay at maturity on Jan. 1, 1923, a like amount of West End Street Railway debenture 4½ per cent bonds. The balance will be used to provide for extensions to the company's power station in South Boston, for new shops in Everett and for the George Street storehouses in Somerville. The offering price is 103 and interest, yielding 5.60 per cent.

Missouri, Oklahoma and Ohio Properties Merged

Formal action in organizing the Missouri Power & Light Company, was taken at Mexico, Mo., on Feb. 28, when the directors and all common and preferred stockholders of the Missouri Utilities Company voted to change the name of the company and form the new organization.

In the formation of the new company the electric, railway, gas and bridge properties at Jefferson City, properties of the North Missouri Light & Power Company, from Hannibal down the river, and properties of the North American Light & Power Company in Oklahoma and Ohio, including the Cahokia Gas & Oil Company, a corporation of Illinois, were taken over, in addition to the properties of the Missouri Utilities Company in Missouri.

The North American Light & Power Company owns all of the common stock of the Missouri Power & Light Company and common stock of the Illinois Traction Company, which controls the Illinois Power & Light Corporation.

Many improvements are contemplated in the properties, particularly additions and extensions to the generating plant and transmission lines.

Approval of Purchase of New York Interurban Sought

The Venango Public Service Corporation, a Pennsylvania company, operating railway lines in northwestern Pennsylvania through ownership of the Northwestern Electric Service Company, has applied to the New York Public Service Commission for authority to acquire and purchase such amounts of the capital stock of the Warren & Jamestown Street Railway as have been or may hereafter be tendered to it and all the stock of the Carroll Electric Light & Power Company.

The Warren & Jamestown Street Railway operates a 22-mile electric railway, 9 miles of which is in New York State. It is controlled by the same interests that administer the affairs of the Warren Street Railway. The stock of that company, as noted recently in the ELECTRIC RAILWAY JOURNAL, is in process of transfer to the Penn Public Service Corporation.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons this week there were sold $26,000 Second Avenue Railroad 6 per cent receiver's certificates, 39 per cent.

Seattle Falls Down Again in January.—Operating revenues of the Seattle Municipal Railway in January were $8,351 and the operating expenses $8,520, leaving an operating deficit of $169. This was increased to $3,554 by the inclusion of other charges.

Bond Issue Authorized.—Permission has been granted by the Georgia Public Service Commission to the Gainesville Railway to issue $100,000 in bonds and $15,000 in additional stock, following the recent purchase by it of the railway properties at that city. The company purchased the property from the Georgia Railway & Power Company, Atlanta.

Partial Abandonment Authorized.—Abandonment of a portion of electric railway from a point near the intersection of Standard Avenue and Scofield Street, Richmond, has been authorized by the California Railroad Commission on the application of trustees of the San Francisco-Oakland Terminal Railways.

Wants to Consolidate and Issue Bonds.—The United Railways & Electric Company, Baltimore, Md., has applied to the Public Service Commission for permission to consolidate its suburban lines under the name of the Maryland Electric Railways. Approval is also asked of the issue of $4,000,000 mortgage bonds, already sold, under a $25,000,000 mortgage on the properties of the consolidated company.

Line Officially Abandoned.—Daniel P. Abercrombie, receiver for the Connecticut Valley Street Railway, announces the line has officially stopped operating. Efforts are being made to induce the court to permit a private sale of the Greenfield & Turners Falls division, which was to be disposed of by public auction.

Permission Sought to Abandon Camden Line.—The Board of Public Utility Commissioners of New Jersey expects to hear on March 17 an application of the Public Service Railway for permission to abandon the Fairview extension from Broadway and Warren Street, Gloucester, to Collings Avenue and Mount Ephriam Avenue, Camden. The petition sets forth that the revenue from the extension is appoximately $11 a day or $4,000 a year, while the overhead cost is approximately $20,950, exclusive of superintendence, depreciation, general and miscellaneous taxes, fixed charges and return on capital.

Payment of Dividend on "L" Authorized.—The directors of the Interborough Rapid Transit Company, New York, have ordered the payment on April 1 of a quarterly dividend of $1 a share on the stock of the Manhattan Elevated Railway. The payment due on this issue in December was omitted because the Interborough system showed a deficit in the quarter ended Sept. 30.

Traffic and Transportation

Seven-Cent Fare in Clayton Temporarily

The United Railways, St. Louis, Mo., has put into effect temporarily a 7-cent fare between points in St. Louis and the courthouse square in Clayton, Mo., with the proviso that it is applicable only to rides on a single transfer between the Kirkwood-Ferguson and Olive-University lines. The Missouri Public Service Commission recently, acting on a complaint lodged by residents of Clayton, ordered the company to equalize the rate of fare from Clayton to St. Louis with that charged between the Maplewood, Mo., loop and St. Louis. A 7-cent fare was charged on the latter trip, while from the Clayton courthouse to points in St. Louis the charge was 14 cents. The United Railways has applied for a new hearing on the question and has announced that in the meantime Clayton will have the 7-cent rate with the restrictions named.

Col. Albert T. Perkins, general manager for the United Railways, stated that if it was necessary to maintain the same rate between Maplewood and St. Louis as between Clayton and St. Louis the company would be forced to raise the Maplewood rate. The company could not profitably maintain a 7-cent rate from the courthouse in Clayton to all points in St. Louis with the same transfer privileges as on the St. Louis lines.

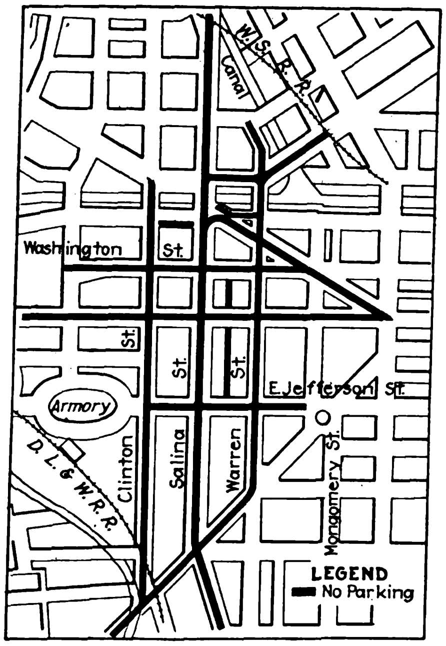
Passholders at Terre Haute Are Steady Customers

Statistics show the user of the pass on the Terre Haute city lines of the Terre Haute, Indianapolis & Eastern Traction Company to be the company's steadiest customer. The pass has been in use in Terre Haute since May 1, 1922. Since then Terre Haute has had its industrial ups and downs because of its dependence on the amount of activity in the surrounding coal mines. During the latter months of 1923 a high percentage of mine idleness was reflected in lower earnings on the electric railway. This gave the opportunity to see how differently the cash and pass riders are affected. The cash fare is 5 cents, while the pass sells at the high price of twenty fares. Hence the pass appeals only to frequent riders and those who like to use the cars for mere convenience.

A comparison of the sixteen weeks ended Dec. 30, 1923, with the corresponding period of 1922 shows that while the cash fares suffered a decline of 4.47 per cent, pass revenue dropped only 1.68 per cent. Moreover, the average gross rides per pass also showed a decline, indicating that because of lesser prosperity the passholder took fewer off-peak rides than before. In the 1923 period the holder of the pass averaged only 31.5 gross rides compared with 34.7 in the 1922 period, a decline of 9.3 per cent. The number of actual net, or origin-to-destination, rides in each case was about 20 per cent less, inasmuch as pass riders are always counted as revenue riders whether on a through or a transfer ride. While the pass revenue declined only 1.68 per cent, the total gross rides on passes declined by 10.68 per cent.

Opinion Divided Over Non-Parking Regulation in Syracuse

Syracuse is another city which has vigorously taken up the parking evil. Jurisdiction in this matter rests with the municipal commissioner of public safety and on Jan. 1, 1924, on the recommendation of the Safety Council, which is a branch of the Chamber of Commerce, he put in force a non-parking regulation covering a number of the important streets in the downtown district. The streets thus covered are shown by the accompanying map and the regulation is defended on the grounds of safety and the necessity for providing clear streets for the operation of the fire department. Parking is prohibited on the streets shown from 8 a.m. to 6:30 p.m., and under the ruling of the corporation counsel a parking car is one which is not loading or unloading.



District in Which Parking Is Prohibited in Syracuse

Vehicle and street car movement on the streets is much more free than before the regulation was adopted, but the opinion of the downtown merchants and business houses is divided on the effect of the regulation on business. The Syracuse *Journal* of Feb. 16 contains the results of a poll of eighty-five leading business houses. Of these fifty-one favor a thirty-minute parking regulation, seventeen favor some sort of parking regulation, five are for no parking, twelve refused to be quoted on the parking limit. In regard to the effect on business forty-eight said their business was being injured by the present regulations, sixteen said their business was not affected and the others were not sure.

Bus Operation Over Unserved Streets Suggested

Peter Witt, who was recently called to Trenton, N. J., to make a survey of trolley and bus operation, has recommended that bus franchises granted to the Central Transportation Company, a subsidiary of the Trenton & Mercer County Traction Corporation, should provide for the operation of the machines over thoroughfares now unserved by trolley cars; that there should be transfer privileges from trolley to bus and that no revenue from the Trenton car riders should be used to make up deficits on the bus lines. Mr. Witt also recommended that bus franchises which are granted to bus companies other than the Central Transportation Company should be only short term grants and other companies should be denied the right to compete with the present system of transportation.

Bus Fares Advanced in Spartanburg

Increased bus fares in the city of Spartanburg and an application to the commission for an increase in railway fares on the suburban lines are the outstanding developments in the continued controversy between the South Carolina Gas & Electric Company and the city of Spartanburg. Since the decision of the South Carolina Supreme Court ordering the company to resume its railway service, the company has decided to appeal to the United States Supreme Court. This action is now pending. As the attorneys have three months from the date of the order to file the appeal, the action will be consummated on or before April 14. Meanwhile the company is continuing the operation of four buses in the city proper and two street cars on the suburban lines.

The bus fares on the South Carolina Gas & Electric Company's lines went up from 5 to 10 cents on Feb. 25, following the decision of the Railroad Commission to refuse to consider a petition filed by the company asking for the authorization of an increase in rates. Ticket books for school children and adults are sold at special rates. The commission refused the petition on the ground that the litigation between the city of Spartanburg and the company was pending in the federal courts, and on the further grounds that in a recent decision the Supreme Court of South Carolina had held that the Railroad Commission had not the authority to approve the substitution of buses for trolley cars on its lines.

George B. Tripp, president of the company, said that the company could not be expected to continue the bus operations unless the income received from fares equaled at least actual operating expenses, even if the income was not large enough to pay for any depreciation, or provide for a reasonable return on the investment.

A hearing will take place on March 27 on the petition of the company for an increase in fares on its suburban lines. The increase will include a 10-cent fare from the city limits to Glendale and vice versa, in the first zone; a 10-cent fare from Glendale to Clifton and vice versa, in the second zone. School children in actual attendance at school will be allowed to purchase commutation tickets in books of sixteen for $1, and in books of four tickets for 25 cents. Adult passengers will be allowed to purchase tickets in books of twelve for $1 or three tickets for 25 cents. These tickets will be accepted as fare in each zone.

Special Limited Service in Ohio

Business on the Red Egg Lines—the Columbus, Newark & Zanesville Electric Railway and the Indiana, Columbus & Eastern Traction Company—is on the upward trend. In the past month and a half eight new fast trains have been placed in service.

Two fast trains, the Capital City Flier and the Gem City Flier, make the run between Dayton and Columbus, a distance of about 100 miles, in two hours and twenty minutes, with only one stop at Springfield, Ohio. Special equipment is used on these limiteds, such as large and heavy cars, making for safety and comfort, particular consideration having been given to the route over which they operate and the high-speed schedule. These trains make connections at Dayton for Indianapolis, Ind.

Following the success of the Capital City and the Gem City Fliers, the Indiana, Columbus & Eastern added two more high-speed trains between Columbus and Dayton. Operating in connection with the Dayton & Western and the Terre Haute, Indianapolis & Eastern, this added service provides through transportation from Columbus to Indianapolis. These trains are known as the Hoosier Special and the Buckeye Special.

After the addition of the first two fliers on the Indiana, Columbus & Eastern came the announcement of four new fast trains on the Columbus, Zanesville & Newark Electric Railway. That company has selected the Indian names of the Shawnee, the Muskigum, the Wyandotte and the Miami for these trains as the country through which this line is laid abounds in rich Indian lore. Only two stops are made by these cars between Columbus and Zanesville, namely, at Newark and Hebron. The trip is made in two hours.

Arthur V. Bland, director of the public relations department of the Red Egg Lines, says that the addition of these eight new trains is only the forerunner of a better and more complete service for the near future. Another change just announced is the moving of the freight departments of these roads to the Interurban Terminal Building at Columbus, Ohio.

Illinois Road Wants Bus Grant Between Aurora and Elgin

An application for authority to operate motor vehicles for passenger and freight service between Aurora and Elgin has been filed with the Illinois Commerce Commission at Springfield by the Aurora, Elgin & Fox River Electric Company, which now operates an electric interurban line between the two cities. The proposed line, it is announced, would follow a route along both the east and west river roads and would in no way interfere with the service of the electric railroad.

At the present time there is no railroad operating all the way between Aurora and Elgin on the one side of the river. There is a direct automobile road on each side. Some residents in outlying districts have difficulty in getting to the interurban stations when they want to go to Aurora or Elgin. With the buses in operation they could ride in them to either of the cities, or to intermediate points. By operating motor vehicles the company would be adding to the present service by providing transportation for those whose homes are a long distance from the electric line.

Six-Cent Fare Measure Extended

The Council of Richmond, Va., has just extended the 6-cent fare ordinance. This measure allows the Virginia Railway & Power Company to charge a 6-cent fare, although franchise requirements fix the fare at 5 cents. The extension is for a period of six months, effective on April 12, when the present 6-cent ordinance is due to expire.

Politics, long the interfering factor in an agreement between the company and the city on the new blanket franchise asked by the company, will probably delay action on this vital measure for at least three months longer. The franchise is before the committee on streets of the Council. The election takes place in the spring, however, and action is being put off so that the franchise issue shall not become involved in the fate of local politicians.

Connecticut Fares Remain Unchanged Temporarily

As a result of the hearing before the Public Utilities Commission on March 11 fares on the lines of the Connecticut Company will remain unchanged until April 14 to permit the counsels for the protesting cities to study the mass of evidence submitted by the Connecticut Company. At the hearing George D. Watrous, chief counsel for the company, argued that there was no reason for treating the Bridgeport division or the city of Bridgeport differently from other cities; that the results of operation neither demanded nor warranted it. Rather was uniformity sought.

The hearing was called to consider petitions from the cities of New Haven, Hartford, Waterbury, Meriden, Stamford and New Britain, which were seeking a reduction of the 8½-cent ticket charge put into effect on Feb. 10. The cash fare is 10 cents.

Permits for Parallel Operation Approved.—The Board of Public Utility Commissioners of New Jersey has granted an application of the Public Service Transportation Company, a subsidiary of the Public Service Corporation, operating the Public Service Railway, for municipal permits to operate four buses between the Pennsylvania Railroad ferries and Forty-fourth Street and Westfield Avenue, Camden. The route parallels in the same streets tracks of the Public Service Railway over the entire distance.

Planning a Clubhouse in Seattle.—Plans are being furthered for the erection of a $100,000 clubhouse for the use of Seattle Municipal Railway trainmen and their families. A recent mass meeting was held to stimulate interest in the campaign to raise funds for this purpose.

Eight Cents Cash Rate.—According to a recent ruling of the Oklahoma State Corporation Commission, the Muskogee Electric Traction Company, Muskogee, Okla., will charge 8 cents for cash fares with two tickets for 15 cents. The order also allows fourteen tickets for $1 and fixes the fares for school children at 4 cents each where twenty-five tickets are purchased at a time.

Applies for Bus Right.—The Jefferson Traction Company, Punxsutawney, Pa., has applied to the Public Service Commission for permission to replace its railway service between Punxsutawney and Big Run with bus service. If the petition is granted the work of removing the car tracks will be started in about two months.

Operates to Beach.—The San Diego Electric Railway, San Diego, Cal., made a trial trip over its new short line to the beaches on Feb. 22. A two-car electric made a fast trip from the heart of the city to Pacific Beach, a distance of 12 miles. The trip was made exactly four months after construction was begun. The company promises service to Mission Beach by May 1 and to La Jolla by July 1.

Commission's Operating Recommendations Accepted.—At the annual meeting of the Union Traction Company of Indiana President Brady reported on the recommendations made by the Public Service Commission as a result of its investigation of the Alfont collision on Feb. 2. The directors instructed the officers of the company to notify the commission that the company would comply with the recommendations of the commission, subject to minor modifications, in the interest of good and safe practice. The recommendations referred to relate to rules and practices in the operation of interurban trains and block signals.

Five-Cent Fare for Trial Period.—The Danville Traction & Power Company, Danville, Va., will go back to the 5-cent fare on April 6 for a ten-day trial period, during which time a careful check of the patronage will be made. If the increase in patronage justifies it, the 5-cent fare will continue, otherwise it will be withdrawn and the present 7-cent fare resumed. Should the fare experiment fail the traction officials will ask permission to use one-man cars.

Personal Items

Auto Maker Heads Electirc Line in Ohio

Mr. Willys Has Been Made President of the Toledo & Western Railroad, Recently Acquired

John N. Willys, president of the Willys-Overland Company, has been elected president of the Toledo & Western Railroad, an electric road which the Willys-Overland interests and the Wabash Railroad have acquired. Thus is the entrance marked of another motor manufacturer into the field of railroading. Mr. Ford in his purchase got a right-of-way and two streaks of rust, which he is engaged in converting into a real railroad and in electrifying. Mr. Willys, on the other hand, gets a fully equipped electric railroad fairly up to date in its appointments and capable of being turned immediately to his use.

J. N. Willys

To the automobile world the career of Mr. Willys is well known. To most men in the electric railway field, however, John N. Willys is probably nothing more than a name linked inseparably with a make of automobile. Mr. Willys entered the automobile industry as a selling agent in Elmira, N. Y. In the dark days of December, 1907, he became uneasy about the non-delivery of Overland cars for which he had booked 500 orders. He went to Indianapolis and there was coolly told by the manager, "We are going into the hands of the receiver tomorrow morning." He then decided to save the company by a money-raising campaign which was a success, and within eight years John N. Willys, saver of the Overland company, was offered $80,000,000 for his share of the company.

In January, 1908, the reorganization was accomplished and Mr. Willys became president the following year. The institution was moved from Indianapolis to Toledo and Mr. Willys became its active head, carrying, in addition to the title of president, that of treasurer and general manager. Under Mr. Willys' guidance the Willys-Overland Company rose to a prominent place in the automotive industry, which position it has held continuously.

Mr. Willys was born in 1873 in Canandaigua, N. Y. He was doing well in his studies and working in a law office when his father died and he had to give up his college dreams. Bicycles were beginning to make their appearance and he saw in them a profitable outlet for his ingenuity as a salesman. He bought a sample bicycle and was duly authorized as a local agent for the manufacturers, and at eighteen he had organized a sales company. Gradually he worked into the wholesale distribution of bicycles and at the age of twenty-seven did a business of $500,000 a year. Then came the automobile and his entrance into that field.

Howard R. Whitney Appointed Vice-President

Howard R. Whitney, Springfield, Mass., was appointed vice-president in charge of operations of the Worcester Consolidated and the Springfield Street Railway, effective March 1. This represents an advance from the office of assistant to the president. Mr. Whitney has been connected with these companies nearly ten years.

Mr. Whitney entered the employ of the Worcester and Springfield companies on Dec. 1, 1914, as engineer of maintenance of way, in charge of tracks and bridges, and a year later extended the scope of his duties to the charge of structures as well, thereby gaining a thorough knowledge of the entire physical properties of the two systems. He was appointed special assistant to the president in December, 1917, and early in 1919 was given the title of assistant. His latest promotion comes as a recognition of his ability in conserving the properties and promoting general efficiency on the systems. He was graduated from Tufts College in 1905 in civil engineering, and was first employed in construction of bridges and maintenance of track for the Missouri Pacific Railroad. Later he became construction engineer for the Central Vermont Railroad's subsidiary, the Southern New England Railroad, with headquarters in Woonsocket, while the projected extension from Palmer, Mass., to Providence, R. I., was being built. After that he was employed in the Boston & Maine's maintenance of way department, and then for one year by a Nashua, N. H., contracting firm.

A. B. Coryell has been appointed general superintendent and purchasing agent of the Windsor, Essex & Lake Shore Rapid Railway, Kingsville, Ont., effective April 1. Mr. Coryell was formerly general superintendent of the Muskogee Electric Traction and the Shawnee & Tecumseh Traction Company in Oklahoma.

F. A. Healy Interurban Pioneer

Accounting Official Helped to Bring Together Properties in Ohio Recently Segregated

F. A. Healy, secretary-treasurer of the Ohio Electric Railway, Springfield, Ohio, and subsidiary systems since the organization of the holding company in 1907, was largely instrumental in developing the property until it became one of the most extensive interurban systems in the Middle West, with more than 500 miles of track covering Ohio and extending into Indiana.

With the segregation of the Ohio Electric System properties in 1921, Mr. Healy again became secretary-treasurer of the Indiana, Columbus & Eastern and leased lines and for a few months following the retirement of J. H. McClure as active receiver he took over the work of the general manager in addition to his other duties.

In point of service Mr. Healy is one of the veterans of the interurban business. He entered the field in the Middle West when development was still in its infancy and assisted in extending the trackage of the Ohio Electric system to all parts of the State.

F. A. Healy

He was born in 1861 at Moline, Ill., and at the age of nineteen entered the offices of the Atchison, Topeka & Santa Fé Railroad. He was consecutively office boy and clerk and assistant chief clerk in the auditor's office. In 1888 he became chief clerk in the auditor's office of the Southern California Railway with headquarters at Los Angeles. In 1893 he became auditor and general freight and passenger agent of the Santa Fé, Prescott & Phoenix Railway with headquarters at Prescott, Ariz.

He then became an expert accountant and served successively as general auditor for the South Carolina & Georgia Railroad, Augusta Southern Railway, Ohio River & Charleston Railroad and auditor for the receiver of the Lake Champlain & Ogdensburg Railroad. He was engaged as an expert accountant on properties controlled by Charles Parsons, then president of the above companies, and from December, 1899, to December, 1906, he was auditor of the Atlanta & West Point Railroad and the Western Railway of Alabama with headquarters at Atlanta, Ga.

In 1906 he assumed the position which he now holds, taking part, during his eighteen years in office, in the development of the Ohio Electric Railway property to a high peak as a unit and also witnessing the segregation of the properties and their operation as separate entities under the changing economic conditions of the present day.

Obituary

Alfred H. Smith

Alfred H. Smith, president of the New York Central Lines and one of the best known railroad men in the United States, was killed on March 8 when he was thrown from his horse in Central Park. Mr. Smith met his death in pulling up suddenly to avoid running into a woman, mounted on a horse, who had ridden across his path.

Mr. Smith was indirectly interested in electric railway affairs through the participation by his company in the joint ownership with the Delaware & Hudson Company of the Schenectady Railway and the ownership by the New York Central of a controlling interest in the New York State Railways, also the ownership by the New York Central of the New York & Harlem Railroad, operating a surface line in New York City. In fact, Mr. Smith was president of the New York & Harlem and a director of each of the others.

Alfred H. Smith was everywhere beloved. He had risen from the ranks, but he came into prominence as an executive after the *entrepreneur* stage in railroading had passed and so he found the task ahead of him one very largely of administration. How well he succeeded as an administrator and executive is shown by the position of the New York Central today both as a money earner and as a public institution. Evidence of his broadminded and liberal attitude toward labor was furnished on many occasions, notably at the recent inquiry by the State of New York into the causes and conduct of the strike on the lines of the Schenectady Railway. The extent of the appreciation of Mr. Smith's unusual ability in circles outside of the railroad world is strikingly instanced by the expressions of deep regret at his untimely death contained in the numerous editorials appearing in the daily press all over the country.

T. W. Passailaigue

Theodore W. Passailaigue, vice-president of the Charleston Consolidated Railway & Lighting Company, Charleston, S. C., died recently, in his sixty-third year. His career with Charleston railways dates back to 1876, when be began service with the Enterprise Railway, a horse car line, at the age of fifteen. He entered service as an office boy, and from this position he was steadily advanced until he was promoted to succeed the late Alfred Ravenel as president of the company.

When the Enterprise Railway was absorbed by the Consolidated Company's interests, which instituted the first electric railway system in Charleston, Mr. Passailaigue was made general superintendent of the system. He was elected vice-president of the Charleston Consolidated Railway, Gas & Electric Company in 1917 and vice-president of the Charleston Consolidated Railway & Lighting Company in 1922, the latter being the operating company.

Mr. Passailaigue had been a member of the American Electric Railway Association since 1884 and was a regular attendant at the annual meetings. He was a member of the city board of school commissioners for twenty years.

John M. Roach

John M. Roach, a member of the board of operation of the Chicago Surface Lines, first vice-president of the Chicago Railways and formerly president of that company, died on March 7 at Fort Myers, Fla. Mr. Roach was long one of the outstanding figures of the electric railway industry. He was president of the American Electric Railway Association in 1899 and 1900, and at the convention of the association in Chicago in 1922 he was one of the seven former heads of the association introduced at the session on Oct. 4 given over to the reunion of the past-presidents.

J. M. Roach

Mr. Roach had an unusual capacity for work and organization. His knowledge of men was, perhaps, his strongest characteristic, and while he had been out of active management of the electric railways in Chicago for the last ten years, he was still loved by thousands of the men who served under him and who are still with the properties there.

He saw the introduction of the cable system in Chicago in 1882 and the trolley system beginning in 1890. It was during his administration that the Chicago properties were rehabilitated beginning in 1908. The record of reconstruction work there completed in three years is said to have been unequaled in traction history.

Mr. Roach began his career in Chicago as a conductor. That was in 1872 in the employ of the North Chicago Street Railway. Because he understood the basic things—his job, his fellow employees, and the human beings who reluctantly handed him their fares—there was promotion to assistant superintendent, superintendent, vice-president and general manager of the West Chicago Street Railway, vice-president and general manager of the system embraced in the Union Traction Company, and president of the three other Chicago companies, then president of the Chicago Railways for six years. In 1914 he concluded to retire from active participation in the management of the Chicago properties. At that time he became a director of the Chicago Surface Lines, but continued as vice-president and director of the Chicago Railways. His fiftieth anniversary of Chicago railway service occurred in 1922. In honor of that event Mr. Roach was the guest of honor at a dinner in December, 1922. Directors of the several companies, heads of departments and old-time friends made up the party of sixty who took part in the testimonial.

Mr. Roach was born in Lowell, Ohio, in 1852. At the age of eighteen, he was attracted by the story of gold discoveries in Montana and went with a party of young men from his home in Belvidere, Ill., on the long western trip on horseback. Visions of wealth vanished after an attempt at mining, and the young man then tried his hand at ranching and newspaper work. In October, 1872, he went to Chicago and was at once attracted by the possibilities of advancement in street railway work. He had a letter of introduction which would have secured a position in the office of the general manager of the company, but he expressed preference for employment as a conductor "so he could learn the business from the car up." How well he succeeded the record of his achievements testifies.

E. E. McCall

Edward E. McCall, former Supreme Court Justice, ex-Public Service Commission chairman and at one time Democratic candidate for Mayor of New York, died on March 12. Mr. McCall was fifty-nine years old.

To Mr. McCall in his office as chairman of the Public Service Commission fell the duty of bringing to a consummation the plans of the then city and state authorities for a far-spreading development of New York City's transit system and the signing of the actual contracts that made this development possible. To his part in this work Judge McCall brought his wide experience in public life, the judicial training of the bench and a personal ability and efficiency far from the usual order.

The appointment of Mr. McCall to the commission met with much adverse comment. He signed the contracts, but was almost constantly under fire from his political opponents and finally was removed from office by Governor Whitman, a Republican.

On March 12 the commission said:

> To him is due the profoundly grateful acknowledgment of the people of the city of New York for all that he accomplished in their name and in their interest, for the unvarying rectitude of his conduct in office, for the signal administrative ability he brought to bear upon the affairs of the commission he headed and for his consistent devotion to the high duties that were given him.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

American Brake Shoe Business Diversified

Good Year for Brake Shoe & Foundry Company—Less Than One-Quarter of Its Sales Were of Brake Shoes

The annual report of President Joseph B. Terbell of the American Brake Shoe & Foundry Company to stockholders, dated March 1, 1924, shows the extent to which this company has expanded in various lines since its organization in 1901. At that time it was almost exclusively a manufacturer of brakeshoes for steam and electric railways. Now the sales of brake shoes amount to less than one-quarter of the combined sales of the entire company.

NATIONAL CAR WHEEL TAKEN OVER

The company as now organized includes the American Malleable Company, Dominion Brake Shoe Company, Ltd., Southern Foundry & Machine Company and Southern Wheel Company, and it also owns more than a 75 per cent interest in American Manganese Steel Company, American Brake Shoe & Foundry Company of California, American Forge Company and Ramapo Ajax Corporation. It has also just completed negotiations for the purchase of the entire outstanding capital stock of the National Car Wheel Company, with plants at Pittsburgh, Pa.; Cleveland, Ohio; Rochester, N. Y., and Sayre, Pa.

It will be seen from this statement that the company has engaged extensively in the manufacture of forgings and of malleable, steel and manganese steel castings. While some of this product is for steam and electric railways, such as brake heads and journal boxes in the malleable castings, special track work and track fixtures in the manganese and steel castings, and for miscellaneous uses in forgings, a very large part goes to other industries, particularly automobile and mining. During the war at its Erie plant the company did a large amount of shell manufacture for the United States and British governments, as well as the manufacture of some cannon, but these works were turned over to the government at the end of the war.

FORTY-ONE INDUSTRIAL PLANTS

The American Brake Shoe & Foundry Company now has forty-one industrial plants in different parts of the country, exclusive of three plants in Canada, which manufacture material for the company. The purpose of having a large number is to reduce delivery freight charges. During 1923 new plants for the manufacture of brakeshoes were opened at Portsmouth, Va., and Houston, Tex., and the erection of an additional brakeshoe plant is under way at Kansas City.

The net earnings of the company for 1923, after depreciation and a reserve for federal taxes have been deducted, amount to $2,727,097, equivalent, after payment of 7 per cent dividends on the preferred stock, to $13.22 per share on the common stock. The dividend paid on the common stock was $5 a share and the company carried over the surplus for the year, $1,267,206. The annual report just issued is the most extensive ever made public by the company.

Registers for Every Requirement

Ohmer Fare Register Company Has Acquired Business of American Taximeter Company

The Ohmer Fare Register Company, Dayton, Ohio, has acquired the business of the American Taximeter Company, New York City. As a result the manufacture of the recording devices for which these two long-established companies are noted is to be concentrated at the plant of the Ohmer Fare Register Company at Dayton. Additional machinery and equipment will be installed. With the consolidation also of the sales and service forces of the two companies, the combined organization will be in a position to serve the transportation industry of American and foreign countries more efficiently than ever before.

OHMER COMPANY A PIONEER

The Ohmer Fare Register Company was organized in 1902 as the successor to the Ohmer Car Register Company and has widely distributed its fare registers for city and interurban railways and its receipt printing and issuing taximeter for taxicabs. John F. Ohmer, its founder, has been the guiding genius of the company in its twenty-two years of successful operation. He was the original inventor of the plurality fare indicating and recording fare register, has taken out more than 100 patents in his own name, and as a crowning achievement to his inventive career he conceived and constructed the Ohmer receipt printing and issuing taximeter. The Ohmer Fare Register Company now owns more than 300 patents covering its various products.

The American Taximeter Company was started in 1910 as a consolidation of the Jones Taximeter Company and the Franco-American Company. Francois Ducasse, its president, introduced in October, 1907, the first taximeters in this country when he imported French machines of the Popp make and installed them on the Darrecq taxicabs operated by the first motor cab company in this country, the New York Taxicab Company, and in which he was interested. Since that time Mr. Ducasse's company has built and distributed the Jones, Popp and Atco taximeters, superior instruments in the field of registering but non-printing taximeters, just as the Ohmer receipt issuing and printing taximeter is standard in its particular field.

The American Taximeter Company has also been a large manufacturer of the Dreadnaught Hub-O-Dometer, a mileage recording device that is installed on the hub of any vehicle, and the Dash-O-Dometer, an instrument devised to provide an accurate check on operating expenses of motor transports. This latter instrument will fill the needs of one branch of the commercial vehicle industry for which the Ohmer Truck Auditor is not intended. The manufacture and distribution of all of these devices formerly produced by the American Taximeter Company is being taken over by the Ohmer Fare Register Company. Thus the combined company will be in a position to fill every recording device need and requirement of the transportation industry.

Merger of Ball Bearing Makers Under Way

Plans for the proposed merger of the Marlin-Rockwell Corporation and the Gurney Ball Bearing Company are fast taking definite shape. The Marlin-Rockwell organization has called a special meeting of its stockholders for March 28, at which they will be requested to approve the terms under which it is proposed their corporation shall take over the Gurney Ball Bearing Company, Jamestown, N. Y.

For the property and other assets of the Gurney company, it is proposed that the Marlin-Rockwell shall issue $2,722,800 in 7 per cent cumulative preferred stock and 133,554 shares of no par value common stock. Marlin-Rockwell at the same time will assume all debts and other liabilities of the smaller company. Marlin-Rockwell stockholders will be requested to authorize the issuance of the amount of preferred stock mentioned above and at the same time authorize an increase in the no par value common stock from 89,251 to 222,805 shares.

Metal, Coal and Material Prices

Metals—New York	March 11, 1924
Copper, electrolytic, cents per lb	14.00
Copper wire base, cents per lb	16.375
Lead, cents per lb	9.00
Zinc, cents per lb	6.86
Tin, Straits, cents per lb	58.375
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.70
Somerset mine run, Boston, net tons	2.225
Pittsburgh mine run, Pittsburgh, net tons	2.125
Franklin, Ill., screenings, Chicago, net tons	1.825
Central, Ill., screenings, Chicago, net tons	1.625
Kansas screenings, Kansas City, net tons	2.25
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft	$6.75
Weatherproof wire base, N.Y., cents per lb	18.00
Cement, Chicago net prices, without bags.	$2.20
Linseed oil (5-bbl. lots), N. Y., per gal	$0.96
White lead, in oil (100-lb. keg), N.Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal	$1.01

Newspaper Account of Braking Tests Misleading

Inquiries have been provoked by recent reports in the Schenectady *Gazette* and several other daily papers regarding braking tests being carried out there. The newspaper accounts grew out of a test by the General Electric Company in that city of a car using the motors as generators for retarding the car, the energy being taken up by resistors. The connections employed in this particular test were somewhat different from those used previously, but there was really no occasion for the wide publicity which the event received. For many years the General Electric Company has supplied electric braking controllers for street car service. Very few of these are in use in this country, however, as the air brake fulfills the requirements much better.

Rolling Stock

Des Moines City Railway, Des Moines, Iowa, has received the second batch of ten cars which were ordered last July. The specifications of the first ten were given in the ELECTRIC RAILWAY JOURNAL, issue of Dec. 29, 1923. The specifications of the second group follow:

Number of cars received		Ten
Name of road		Des Moines City Railway
Date order was placed		July 1, 1923
Date of delivery		Feb. 10, 1924
Builder of car body		McGuire Cummings
Type of car		Passenger-semi-motor
Seating capacity		Forty-eight
Weight	Car body	20,000 lb.
	Trucks	10,000 lb.
	Equipment	8,000 lb.
	Total	38,000 lb.
Length over all		46 ft.
Truck wheelbase		5 ft. 6 in.
Width over all		8 ft. 3 in.
Height, rail to trolley base		11 ft. 6 in.
Body		Semi steel
Interior trim		Cherry
Headlining		Agasote
Roof		Arch
Air brakes		G. E. straight
Armature bearings		Sleeve
Axles		Standard Steel Works
Bumpers		Channel
Car signal system		Faraday
Car trimmings		Brass
Center and side bearings		Plain
Conduits and junction boxes		Duraduct
Control		G.E.K.-35
Couplers		Portable
Curtain fixtures		Curtain Supply Company
Curtain material		Pantasote
Designation signs		Hunter
Door-operating mechanism		National Pneumatic Company
Wheelguards		H.B.
Gears and pinions		G. E. grade M
Hand brakes		Peacock
Heater equipment		Consolidated
Headlights		Golden Glow
Journal bearings		Plain
Journal boxes		McGuire-Cummings
Lightning arresters		G. E.
Motors, type and number		4-G.E. 247-1
Paint		Enamel
Registers		International
Sanders		Des Moines Railway standard
Sash fixtures		Dayton Manufacturing Co.
Seats		Heywood-Wakefield
Seating material		Cane
Springs		Railway Springs Company
Step treads		Kass-Feralun
Trolley base		U. S. No. 13-E
Trolley wheels		More Jones
Trucks		McGuire-Cummings
Ventilators		Utility
Wheels		26-in. rolled steel

New York State Railways through its subsidiary, the Rochester Co-ordinated Bus Lines, plans the purchase of additional trolley buses.

Track and Line

Cleveland Railway, Cleveland, Ohio, plans a crosstown line on 117th Street, the boundary between Cleveland and Lakewood. The cost is estimated at $100,000. The project waits on the approval of a bond issue.

Tennessee Electric Power Company, Nashville, Tenn., is carrying out a track improvement program in Chattanooga which calls for an expenditure of $60,000 during the year. The work includes the installation of new crossties and new rails.

Pacific Electric Railway, Los Angeles, Cal., has ordered from the Union Switch & Signal Company the materials for equipping the double-track line between Dominguez and San Pedro, using color light signals. Forty-two Style "N" light signals, 105 single impedance bond layouts, 130 a.c. relays and 94 vertical rotary switch circuit controllers will be required, the field installation being performed by the railway company's signal construction forces.

Power Houses, Shops and Buildings

Gardner & Templeton Street Railway, Gardner, Mass., is planning improvements in the East Templeton power house.

Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich., recently installed an automatic substation at Walker Station. Its success has led to the installation of a second substation at the Coopersville station.

Public Service Corporation, Newark, N. J., recently purchased a portion of the plant of the Rogers Locomotive Works in Paterson. It is said that extension of the car storage facilities in Paterson of the Public Service Railway is expected.

Municipal Railway, San Francisco, Cal., has prepared plans and specifications for an addition to its present Seventeenth Street carhouse. This addition will give needed office and car storage space.

Trade Notes

Harper & Taylor, Inc., Philadelphia, Pa., will conduct a general engineering business paying particular attention to the design, construction and operation of hydro-electric projects. An announcement to this effect was made recently by John L. Harper, vice-president and chief engineer of the Niagara Falls Power Company, and H. Birchard Taylor, vice-president of the William Cramp & Sons Ship & Engine Building Company. An office is also located at Niagara Falls.

Cornell S. Hawley, president of the Consolidated Car Heating Company, has recently returned from a transcontinental trip, during which he visited Chicago, Denver, Salt Lake City, Vancouver, Portland, Tacoma, Seattle, San Francisco and Los Angeles.

New Advertising Literature

Warren Webster & Company, Camden, N. J., have issued "Webster from the Air," an unusually attractive pamphlet containing some exceptionally interesting aerial photographs of representative American cities using Webster systems of steam heating. The pamphlet says the Webster engineering service is prepared to offer suggestions from the experience of practical engineers leading to satisfactory operation of the steam plant from the moment of its installation.

Gold Car Heating & Lighting Company, Brooklyn, N. Y., is distributing a catalog and instruction book of heater equipment. Diagrams are given for thermostatic control of electric heaters and the latest types of electric heaters are described in considerable detail. Rules are also given for figuring the number of heaters required for different sized cars.

"Steinmetz and His Discoverer" is the title of a twenty-four-page booklet recently written by John T. Broderick, an early associate of Dr. Steinmetz in the General Electric Company. Mr. Broderick points to E. Wilbur Rice, Jr., as the discoverer of Steinmetz and their meeting in a Yonkers workshop thirty years ago is described. An outline of the growth of the electrical industry during the past twenty years follows as a prelude to Mr. Broderick's description of the influence of the two men on electrical progress.

Irving Iron Works, Long Island City, N. Y., has issued catalog 4-A 96, which describes the Irving subway.

W. S. Godwin & Company, Baltimore, Md., have just issued a twenty-page booklet descriptive of their continuous steel ties and Godwin paving guards. The economies and advantages of the Godwin construction for paved railways are fully treated. The material described is illustrated in a series of diagrams.

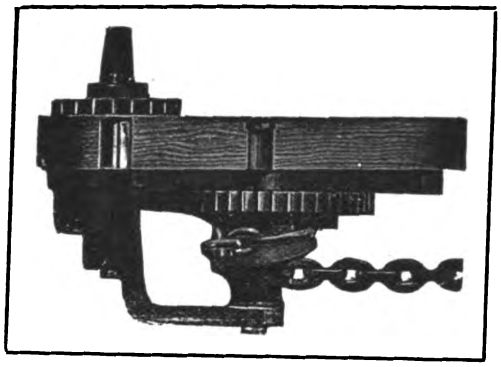
John C. Dolph Company, Newark, N. J., has issued a post-card pamphlet giving information on its insulating varnishes with a revised price list.

Knickerbocker Portland Cement Company, New York, N. Y., has issued a pamphlet on "Twenty-one reasons for our sales policy."

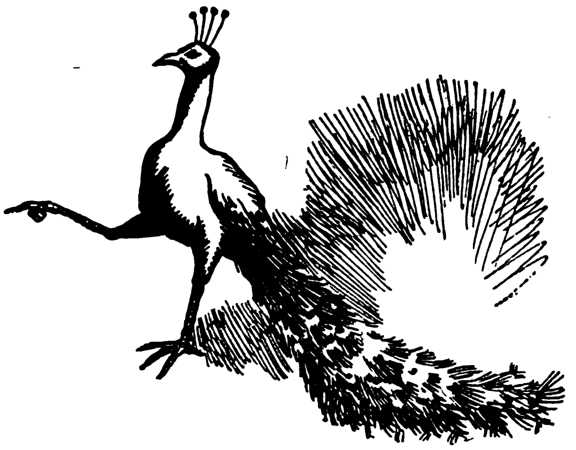
The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has issued bulletin No. 33, on the subject of "Creosoted Materials." The pamphlet contains a brief account on wood conservation and wood preservation.

National Paving Brick Manufacturers' Association, Cleveland, Ohio, has issued a ninety-two-page booklet describing the construction of vitrified brick pavements. Some recommended specifications are included for drainage, grading, bases, bedding, laying brick and filler. The pamphlet also gives some miscellaneous uses of vitrified brick with specifications for private drives, sewers, bridges, railroad and architectural purposes.

PEACOCK IMPROVED BRAKE



Peacock Improved Brake



A few turns of the wheel will bring the heaviest car to a smooth swift stop

The Peacock Improved Brake is the product of long experience and practical knowledge of emergency conditions. A few turns of the wheel will bring the heaviest car to a smooth swift stop. A combination of instant action and maximum leverage is obtained through the eccentric chain-winding drum.

Peacock Brakes save their cost in reducd emaintenance.

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canada:—Lyman Tube & Supply Co., Ltd., Montreal

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND NEW YORK
1570 Hanna Bldg. 84 Pine St.

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

The J. G. White Engineering Corporation
Engineers—Constructors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation
Management
52 Vanderbilt Ave., NEW YORK

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation,
Studies on Financial and Physical Rehabilitation
Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and
Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

KELLY, COOKE & COMPANY
Engineers
149 BROADWAY 424 CHESTNUT STREET
NEW YORK PHILADELPHIA

The Most Successful Men in the Electric Railway
Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

J. ROWLAND BIBBINS
Engineer—921 Fifteenth St., WASHINGTON, D. C.
TRANSPORTATION
Complete Transit Surveys and Development Programs, adapting Motor-Transport, R.R. Terminal and City Plans. Traffic, Service, Routing, Operation and Valuation. EXPERIENCE IN 20 CITIES

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. Richmond, Va.
Established Feb. 1913.

A. L. DRUM & COMPANY
Consulting and Constructing Engineers
VALUATION AND FINANCIAL REPORTS
RATE STUDIES FOR PRESENTATION TO PUBLIC SERVICE COMMISSIONS
CONSTRUCTION AND MANAGEMENT OF ELECTRIC RAILWAYS
230 South Clark Street
Chicago, Ill.
215 South Broad Street
Philadelphia, Pa.

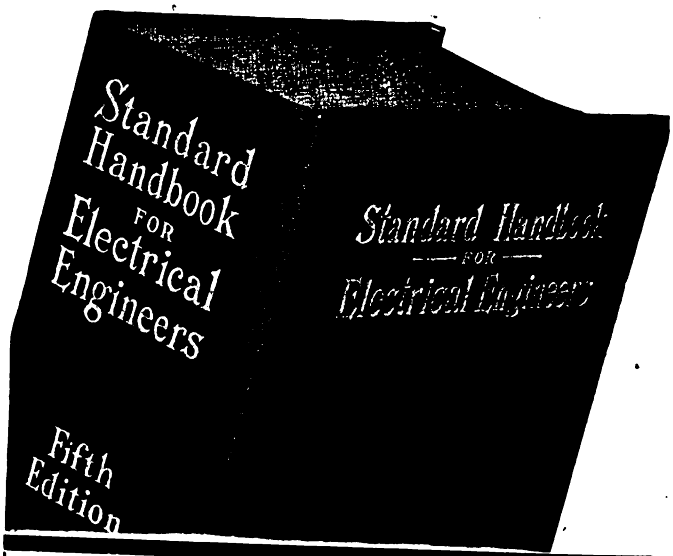
C. B. BUCHANAN
President
W. H. PRICE, JR.
Sec'y-Treas.
JOHN F. LAYNG
Vice-President
BUCHANAN & LAYNG CORPORATION
Engineering and Management, Construction, Financial Reports, Traffic Surveys and Equipment Maintenance
BALTIMORE
825 Equitable Bldg.
Phone:
Hanover 2142
NEW YORK
49 Wall Street

Transmission Line and Special Crossing Structures, Catenary Bridges
WRITE FOR OUR NEW DESCRIPTIVE CATALOG
ARCHBOLD-BRADY CO.
Engineers and Contractors SYRACUSE, N. Y.

N-L VENTILATORS
Write for new catalogue
"Superior Ventilation"
THE NICHOLS-LINTERN COMPANY
7960 Lorain Ave., Cleveland, Ohio.
N-L Products manufactured and sold in Canada by
Railway and Power Engineering Corporation, Ltd.
133 Eastern Avenue, Toronto, Ontario

THE P. EDWARD WISH SERVICE
50 Church St.
NEW YORK
Street Railway Inspection
DETECTIVES
131 State St.
BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.


Standard Handbook for Electrical Engineers
Fifth Edition
Standard Handbook for Electrical Engineers

Keep this new edition of the Standard on your desk for ten days free

In ten days' time—in a single day's time—the Standard Handbook for Electrical Engineers can save you much more than it costs.

It has meant that much to the thousands who have bought it.

It will mean that much to you.

Here spread out before you conveniently, carefully indexed for quick reference, compressed into brief, handy form, are the essential tables, formulas, descriptions of methods and equipment, explanations of principles, and other reference data on electrical engineering that you can put to such good use day in and day out.

It is the one book you need

So great has been the demand for the new fifth edition of this great encyclopedia of electrical engineering that a second big printing was necessary five weeks after first publication.

The total issue of this book is now 78,000 copies.

It is the most widely-used electrical book in the world.

But see it—Send the coupon

See this new fifth edition of the STANDARD HANDBOOK. Send for a copy for ten days' free examination. Get your copy now and start at once making use of its helpful information. Simply fill in and mail the attached coupon.

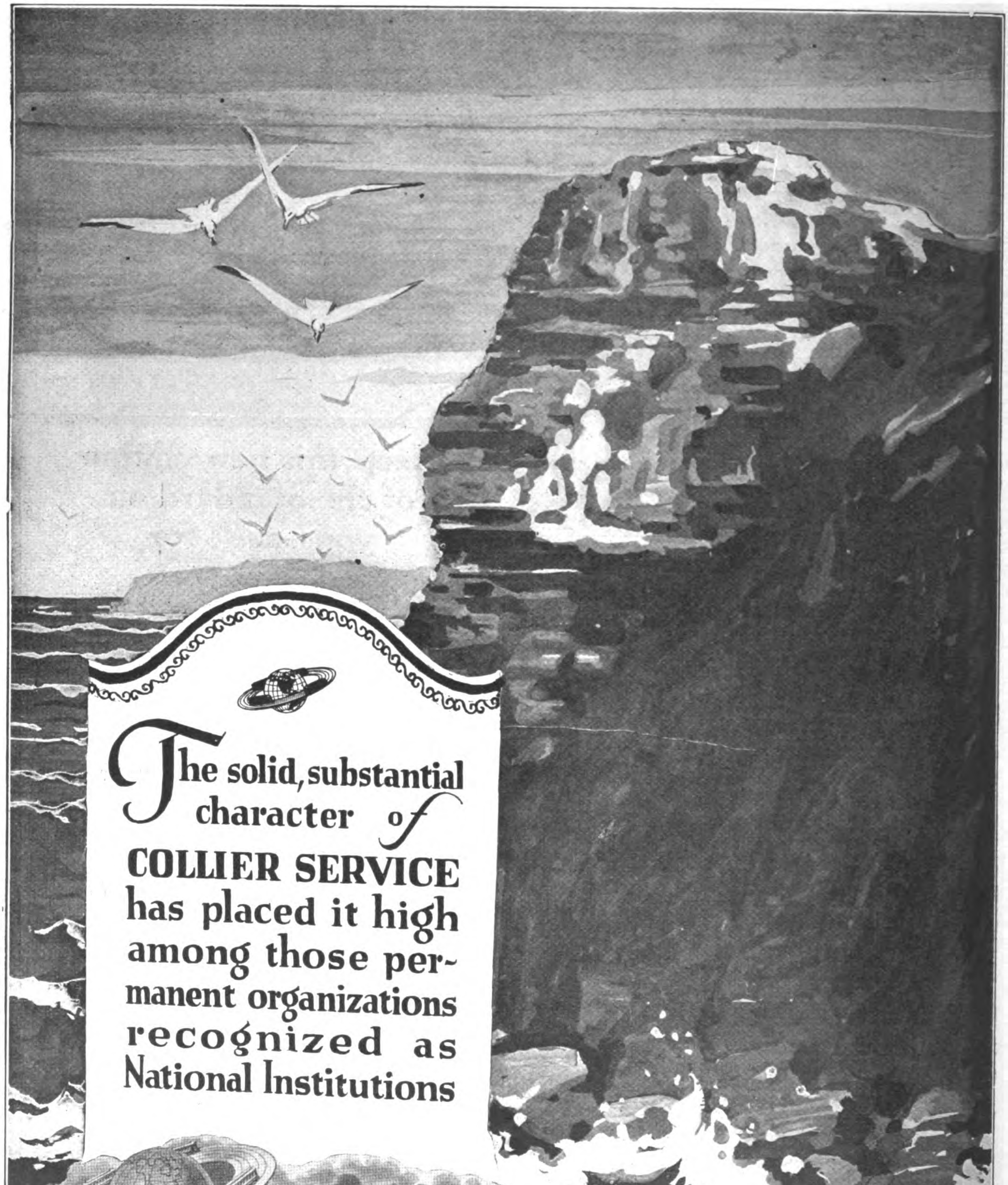
McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y.

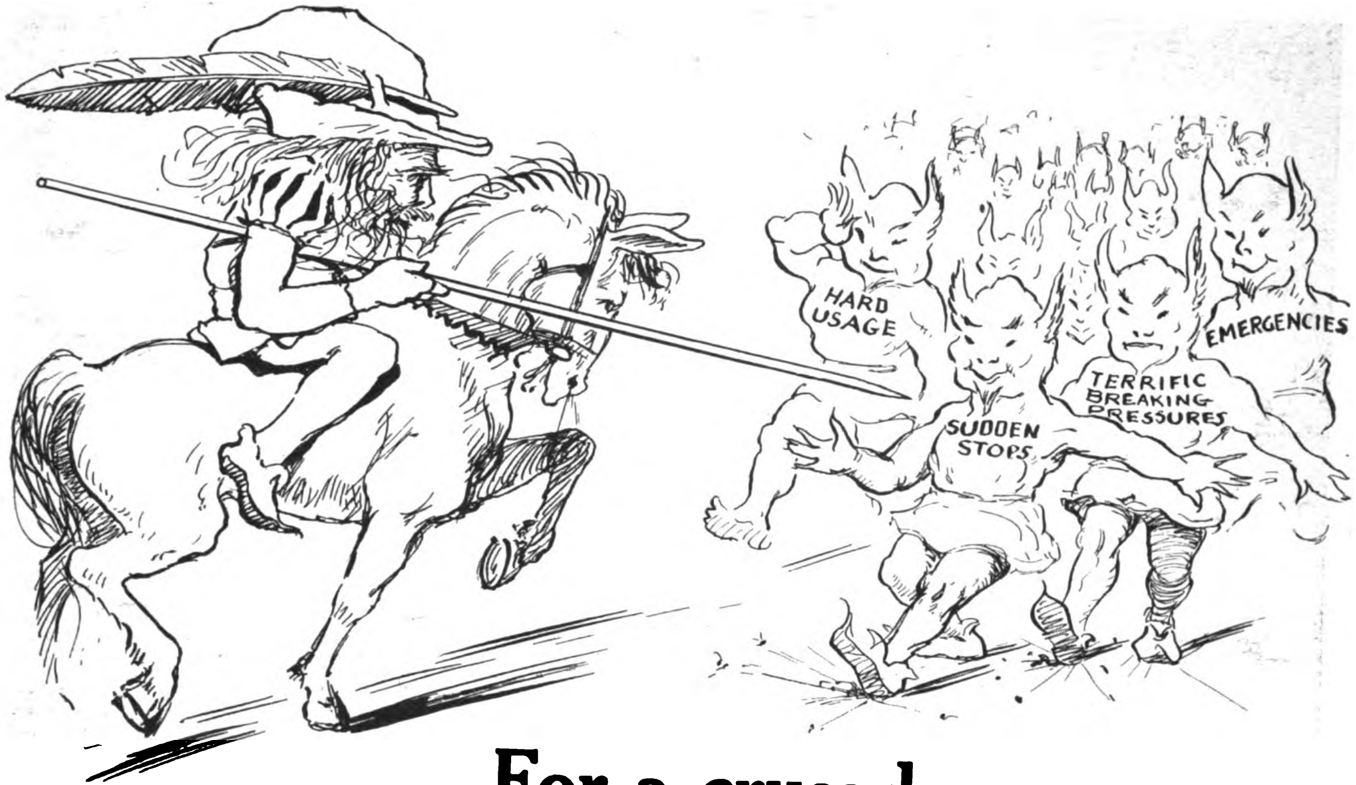
You may send me on 10 days' approval **Standard Handbook, New Fifth Edition, $6.00 net.** I agree to pay for the book or return it postpaid within 10 days of receipt.

Regular subscriber to Electric Railway Journal?..................
Member of A. I. E. E.?..................
Signed ....
Address ....
Official Position..................
Name of Company..................

(Books sent on approval to retail purchasers in the U. S. and Canada only.)
E. 3-15-24



The solid, substantial character of
COLLIER SERVICE
has placed it high among those permanent organizations recognized as National Institutions
Barron G. Collier
INCORPORATED



For a crusade against high maintenence

BOYERIZE!

Even the trusty steel of olden times couldn't stand up to the strains of a brake rigging job on city cars.

Only specially hardened steel can live at all. Only Boyerized steel with its glossy armor plate surface can give full service and protection.

Experience has proved that it actually outwears case-hardened steel three to four times.

Choose from the long wear line

It's Boyerized!

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrums
Center Bearings
Side Bearings
Spring Post Bushings
Spring Posts
Bolster and Transom Chafing Plates
McArthur Turnbuckles
Manganese Brake Heads
Manganese Truck Parts
Bushings
Bronze Bearings

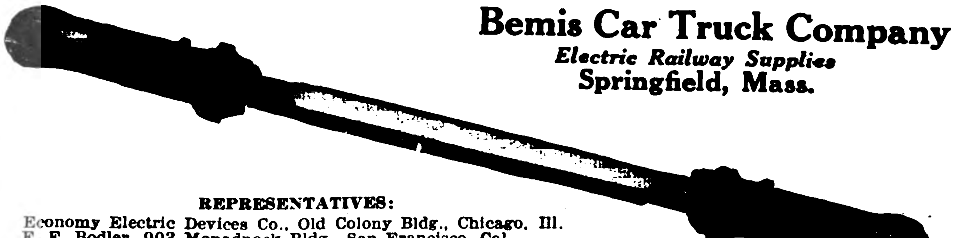
The McArthur Turnbuckle

You won't have to refit the rigging with new turnbuckles, if you specify McArthur Turnbuckles in the first place. They will last as long as the truck itself.

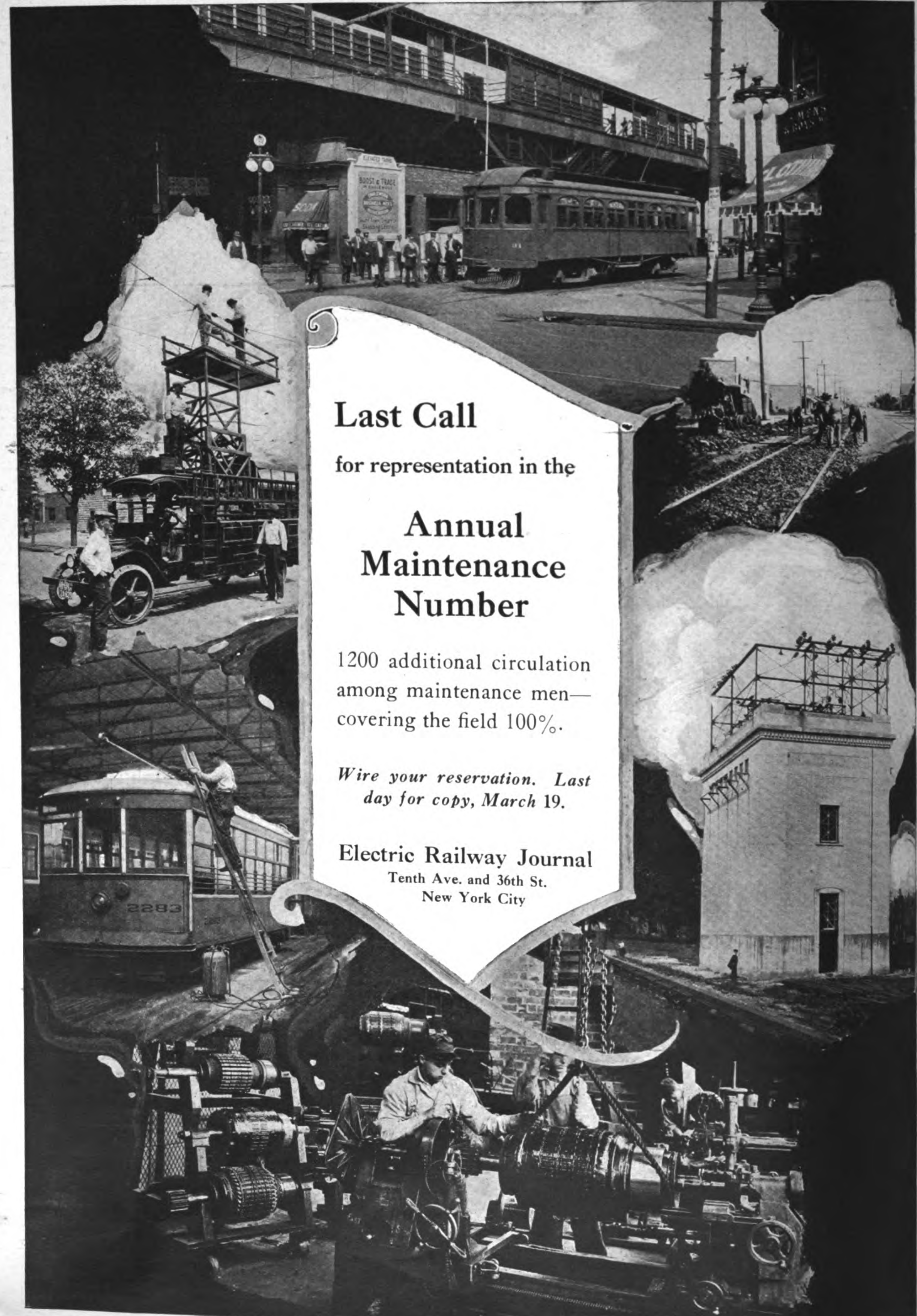
More than that—the old-style jam-nut idea has been scrapped, and an efficient spring-equpped, split-clamp principle has been substituted. Now it only takes a pocket-wrench and a moment's time to make an adjustment, and tighten it up to stay.

Full details on request. Let us quote you.

Bemis Car Truck Company
Electric Railway Supplies
Springfield, Mass.



REPRESENTATIVES:
Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Oregon.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.



Last Call

for representation in the

Annual Maintenance Number

1200 additional circulation among maintenance men—covering the field 100%.

Wire your reservation. Last day for copy, March 19.

Electric Railway Journal
Tenth Ave. and 36th St.
New York City

THERMIT
RAIL
WELDING

SAVE MAINTENANCE COSTS in "Shop" and "Way" by THERMIT WELDING

Thermit Rail Welding is the last word in modern rail welding

This book "Thermit Rail Welding" treats the whole subject of rail welding in detail. It is well illustrated with explanatory photographs showing the simplicity of the method of absolutely eliminating rail joints.

WRITE FOR A FREE COPY

It Contains Chapters on

1—Thermit-Welding New Rail.
2—Thermit-Welding Old Rail.
3—Welding Thermit Compromise Joints.
4—Constructing Thermit-Welded Frogs and Crossings.
5—Thermit-Welding Broken or Loose Arms of Mates and Switches.
6—Discussion of the Theory of Rail Joints.

35 Welded Rail Joints a Day

Many companies are welding 20 joints a day with a single burner preheater and four men. Others using a double burner preheater and seven men average 35 to 40 welded joints per day.

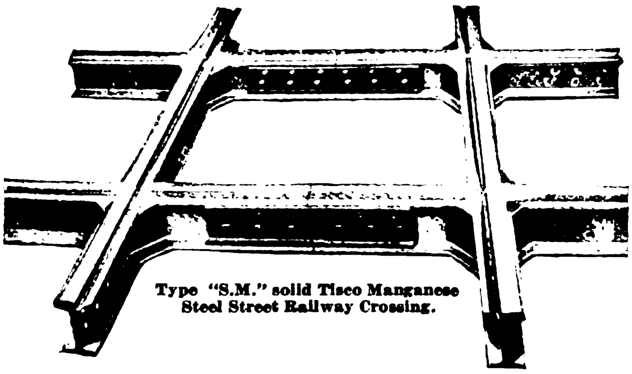
METAL & THERMIT CORPORATION
120 Broadway, New York
Pittsburgh Chicago Boston S. San Francisco Toronto

SERVICE STRENGTH ECONOMY

TAYLOR-WHARTON IRON & STEEL CO.

TIOGA STEEL & IRON CO. Wm WHARTON Jr. & CO. INC. PHILADELPHIA ROLL & MACH. CO.

Solid TISCO Manganese Steel Street Railway Crossing



Type "S.M." solid Tisco Manganese Steel Street Railway Crossing.

This crossing is cast in two pieces; the ends are shaped to suit any section of rolled rail, and fishplate bearings are ground true to take standard plain joints. This is but one of many types of work furnished by this Company to the electric railway industry.

Covering a long period of years, the engineering staff of Wm. Wharton Jr. & Co., Inc., has collaborated with many of the foremost railway engineers of this country and abroad in designing and fabricating some of the most successful trackwork in operation.

For standard and special trackwork this Company has unusual facilities.

WM. WHARTON JR. & CO., INC.
Easton, Pa.

Taylor-Wharton Iron & Steel Co.
Plant at High Bridge, N. J.
Manganese Steel Wearing Parts

Wm. Wharton Jr. & Co.
Plant at Easton, Pa.
Special Trackwork Cylinders for Gases

Tioga Steel & Iron Co.
Plant at Philadelphia, Pa.
Forgings Hammered and Pressed

Phila. Roll & Machine Co.
Plant at Philadelphia, Pa.
Rolls and Rolling Mill Machinery

Sunguth

When the Hindu bride's ancestral god doesn't bring good luck, the husband becomes possessed (sunguth).

—hunts out the lurking spirit

—shuts him in a gourd

—takes the gourd far out to a lonely spot and gurgles the equivalent to "On your road, dearie, this is only half way."

How much better it would be if operators would do the same with brushes, when they act up.

Instead of monkeying with wrong brushes, trying to get Morganite service out of them

—drop them, as above stated, and

—get Morganite.

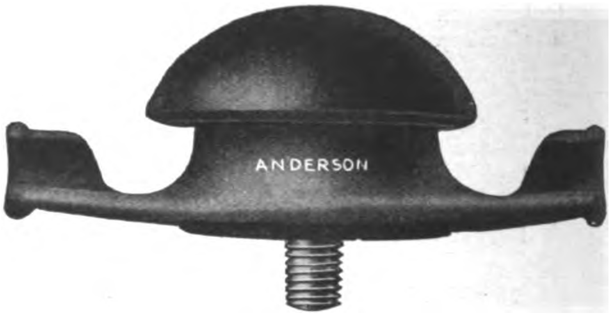
Morganite Brush Co., Inc.

Main Office and Factory:
519 West 38th St., New York

DISTRICT ENGINEERS AND AGENTS

Pittsburgh, Electrical Engineering & Mfg. Co., 909 Penn Ave.
Cincinnati, Electrical Engineering & Mfg. Co., 607 Mercantile Library Building.
Cleveland, Electrical Engineering & Mfg. Co., 422 Union Building.
Buffalo, Electrical Engineering & Mfg. Co., 409 Lafayette Building.
Philadelphia, Electric Power Equipment Corp., 412 North 18th St.
Baltimore, O. T. Hall, Sales Engineer, 1926 Edmondson Ave.
Revere, Mass., J. F. Drummey, 75 Pleasant Street.
Los Angeles, Special Service Sales Co., 502 Delta Building.
San Francisco, Special Service Sales Co., 202 Russ Building.
Toronto, Can., Railway & Power Engineering Corp., Ltd., 131 Eastern Ave.

TRADE ANDERSON MARK



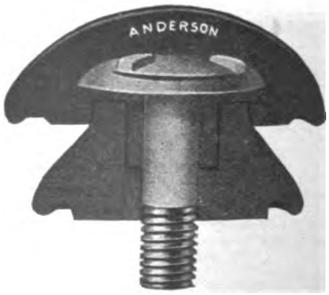
Cap and Cone Suspensions

The malleable iron casting, which takes the strain, spreads out and protects the insulation from trolley blows and also acts as a watershed.

Fins on the head of the steel stud prevent it from turning when tool is used for tightening. The head is larger than the hole in the Suspension Casting, which prevents the wire from falling in the event of injury to the insulation.

Anderson Cap and Cone Suspensions are made for Straight Line, Single and Double Curve, Barn, Strain, Rigid and Hinged Bracket Arm.

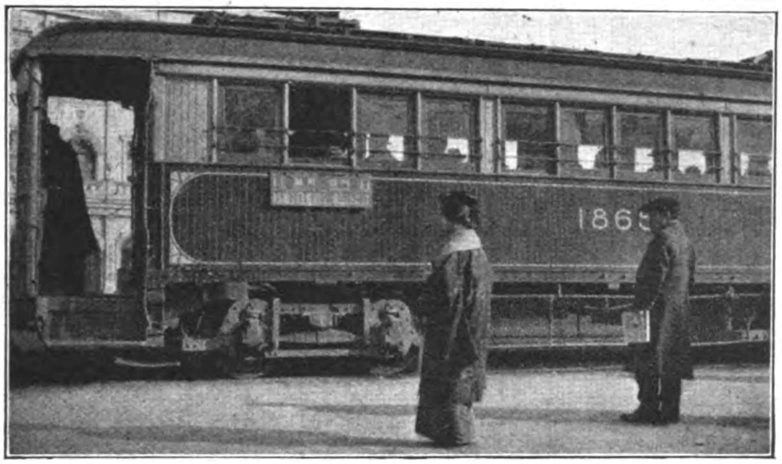
We will be glad to quote you on your next Cap and Cone requirements.



Albert & J. M. Anderson Mfg. Co.
289-305 A St., Boston, Mass.

Branches:
New York, 135 Broadway
Philadelphia, Broad and Chestnut Sts.
Chicago, 105 So. Dearborn St.
London, 12 Moor Lane, E. C. 2.

Baldwin Electric Motor Trucks in Japan



The illustration shows a car in the city service equipped with Baldwin Class "L" Electric Motor Trucks. Where two-motor equipment is used, this truck is very satisfactory. The motors are outside hung, thus permitting of a short wheel base.

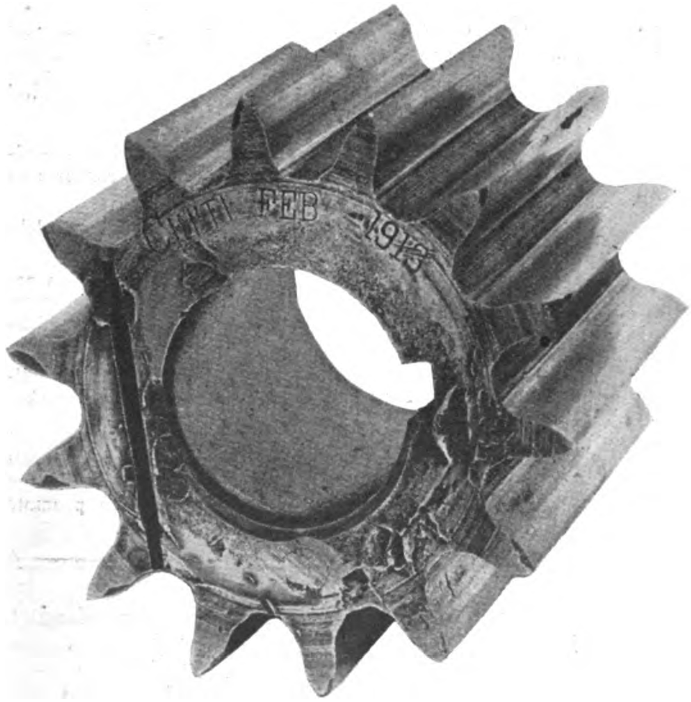
Cars equipped with these trucks may be readily repaired in railway shops.

Among the features of this truck are simplicity in construction, economy in current used and low cost of maintenance.

Speed in construction and delivery is a feature of Baldwin Service.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U. S. A. Cable Address, "Baldwin, Philadelphia"



492,750 miles

May 3, 1913
to
April 10, 1922

In that steady grind of ***City Railway*** service

"Tool Steel"

And the user writes:

"We have several other pinions yet in service and in good condition which will probably give service almost equal to the one we have just taken out."

"Tool Steel" Quality T. S. Q. "Tool Steel" Quality

The Tool Steel
Gear and Pinion Co.
CINCINNATI, O.

Everything in Insulation
"SPAGHETTI"

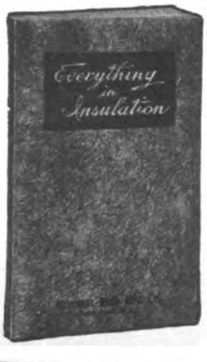
"Inside" information:—
Mr. W. B. Stevens explains why M-R "Impregnated" stands a breakdown test of 7000 volts.

"Every fibre of the fabric is *impregnated:* the wall is built up of successive layers of insulating varnish—each baked before the next is applied. Careful workmanship and high-grade varnish contribute equally to making *'M-R Impregnated Varnished Tubing'* highest in dielectric strength."

MITCHELL-RAND
"*Everything in Insulation*"

We introduced *"Spaghetti"* nearly fifteen years ago, and the original, or genuine "Impregnated" style is still the criterion of quality. Our "Dipped" style is suggested for moderate voltages; *"Saturated Sleeving"* is excellent for motor leads and similar work, where high finish is not as important as protective insulation or economy in labor over the use of untreated cotton sleeving.

Wholesale only



"Spaghetti" is but one of our many classes of insulation—fibre, paper, mica, varnish, compounds, etc. A handbook covering the origin and use of these products will be sent free to any user of insulating materials.

Mitchell-Rand Mfg. Co.
18 Vesey St., New York

This Paper is a "Member *of the* A.B.P."

To you, this is a fact of especial significance, for it means that this publication is part of a concerted movement to raise the level of publishing practice, to assure better service to both subscribers and advertisers.

The "A.B.P." is built upon and revolves around the following set of standards—

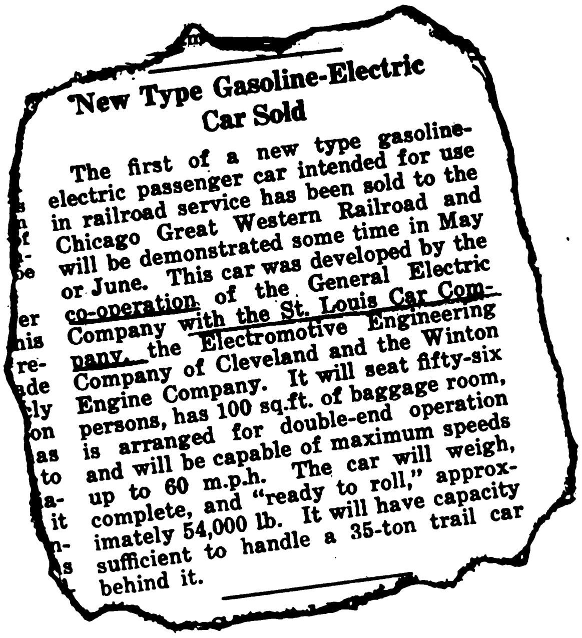
STANDARDS *of* PRACTICE

THE publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation statements, subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Publications which have subscribed to these standards have earned the preferred consideration accorded them.

THE ASSOCIATED BUSINESS PAPERS, INC.
220 West 42nd St., New York



New Type Gasoline-Electric Car Sold

The first of a new type gasoline-electric passenger car intended for use in railroad service has been sold to the Chicago Great Western Railroad and will be demonstrated some time in May or June. This car was developed by the co-operation of the General Electric Company with the St. Louis Car Company, the Electromotive Engineering Company of Cleveland and the Winton Engine Company. It will seat fifty-six persons, has 100 sq.ft. of baggage room, is arranged for double-end operation and will be capable of maximum speeds up to 60 m.p.h. The car will weigh, complete, and "ready to roll," approximately 54,000 lb. It will have capacity sufficient to handle a 35-ton trail car behind it.

←"co-operation" —that's the big idea

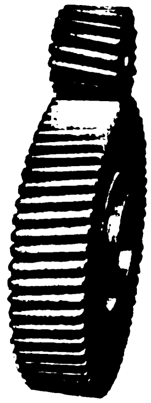
This is just the kind of thing that tells the story of St. Louis Car Company's service to the industry!

We have the facilities and the organization to afford unusually careful attention to special jobs, and to new developments. Whether your order is for a standard safety car, or for an entirely new and unique idea in car design, it will receive the necessary consideration here to insure a "Quality" job throughout.

Let us figure on all your car requirements

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"

"QUALITY CARS"
City Cars
Universal Safety Cars
Interurbans
Buses



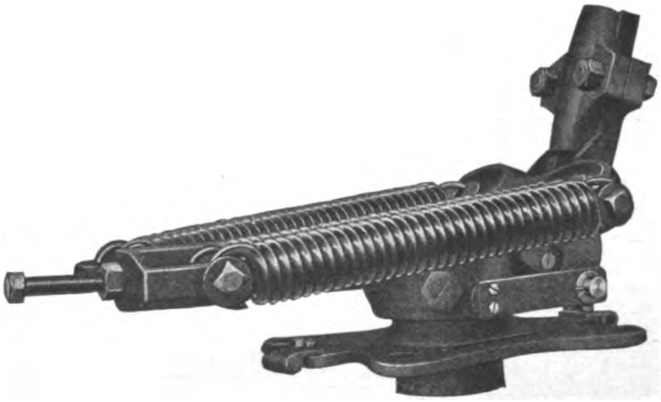
Nuttall Helical Gear Set

Are you obtaining maximum efficiency and minimum maintenance cost from your gears? Nuttall Helical Gears insure both.

Nuttall Trolleys are standard equipment on most of the principal systems in the country. Write for catalog.

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.



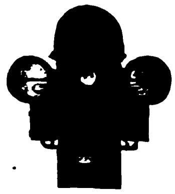
The Baker
Wood Preserving Company
CREOSOTERS
Washington Court House, Ohio

Cross Ties Bridge Timbers
Lumber Posts
Piling

Treated and Untreated

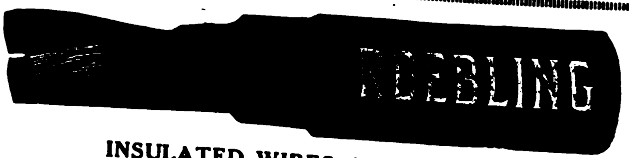
We solicit your inquiries

Creosoting Plant located
Washington Court House, Ohio
On—Penna. R.R., B. & O. R.R., D. T. & I. R.R.
Operating Mills in Southern Ohio



U. S. ELECTRIC
AUTOMATIC SIGNAL
for single track block signal protection
United States Electric Signal Co.
West Newton, Mass.

Peirce Sign Hangers
For Span Wires
A dependable Hanger which will always keep your signs in a vertical position.
HUBBARD & COMPANY
PITTSBURGH CHICAGO



INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

Lapp Insulators
Trade Mark
Lapp Insulator Co. Inc. LeRoy, N.Y.

AMERICAN ELECTRICAL WORKS
AMELECTRIC
Wires and Cables
PHILLIPSDALE, R.I.
Reg. U. S. Pat. Office

Incandescent Lamp Cord

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

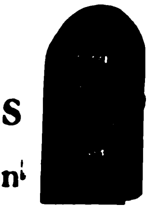
AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

AIMCo

SEND TODAY
for our new Publication
on
SAFETY
and
EFFICIENCY
in Electric Railway
Signals and
Crossing Bells

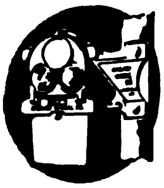
American Insulating
Machy. Co., Inc.
521 Huntingdon St., Philadelphia, Pa.

Chapman
Automatic Signals
Charles N. Wood Co., Boston



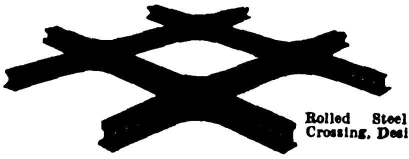
STANDARD
WIRES, CABLES AND CABLE ACCESSORIES
Manufactured by STANDARD UNDERGROUND CABLE CO.
Boston, New York, Philadelphia, Washington, Pittsburgh, Chicago, Detroit,
St. Louis, San Francisco

AUTOMATIC SIGNALS
Highway Crossing Bells
Headway Recorders
NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KENTUCKY.



ANACONDA
TROLLEY WIRE
ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.
THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

Bethlehem Products for Electric Railways



Rolled Steel Alloy Crossing, Design 960.

Frogs, Switches, Special Trackwork, Rails, Car Wheels, Gear Blanks, Axles, Armature Shafts, Splice Bars, Bolts, Spikes, and Track Accessories.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

Sales Offices in the Following Cities:

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Cincinnati Detroit Chicago St. Louis San Francisco

---

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new
Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

Lorain Special Trackwork Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

SPECIALISTS

in the

Design and Manufacture

of

Standard—Insulated—and Compromise Rail Joints

The Rail Joint Company
61 Broadway, New York City

BARBOUR-STOCKWELL CO.

205 Broadway, Cambridgeport, Mass.
Established 1858

Manufacturers of

Special Work for Street Railways

Frogs, Crossings, Switches and Mates
Turnouts and Cross Connections
Kerwin Portable Crossovers
Balkwill Articulated Cast Manganese Crossings

ESTIMATES PROMPTLY FURNISHED

BUDA
ESTABLISHED
1881

Special Track Equipment and Layouts of all kinds

THE BUDA COMPANY
Harvey (Suburb Chicago) Illinois

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

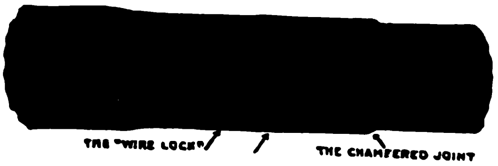
BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

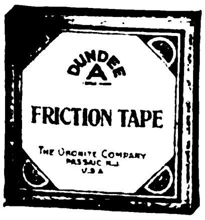
BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

ELRECO TUBULAR POLES



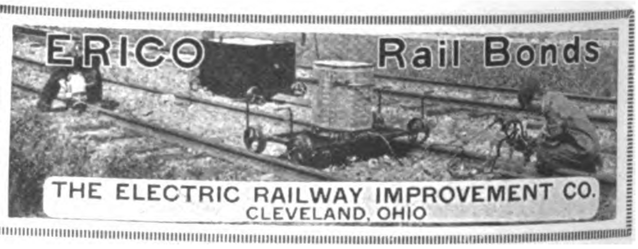
COMBINE
Lowest Cost
Least Maintenance
Lightest Weight
Greatest Adaptability
Catalog complete with engineering data sent on request
ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
NewYork City, 30 Church Street

DUNDEE "A" AND "B" FRICTION TAPES



are
Okonite
Products
'Nuff Said!

Write for Samples and Circulars
THE OKONITE CO., Passaic, N. J.
Incorporated 1884
Sales Offices: New York—Atlanta—Pittsburgh—San Francisco
Agents: Central Electric Co., Chicago, Ill.; Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.

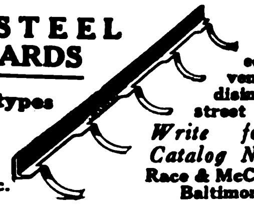


THE WORLD'S STANDARD
"IRVINGTON"
Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds
Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities

CRANES
Full Revolving
No Outriggers
Motor Truck Mounting
Send for Bulletin No. 22
The Universal Crane Co., 1192 Swetland Bldg., Cleveland, O.

Shaw Lightning Arresters
Standard in the Electric Industries for 35 years
Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

GODWIN STEEL PAVING GUARDS
Adapted to all types of rails and paving.
W. S. GODWIN CO., Inc.



Proven by service to economically prevent seepage and disintegration of street railway paving.
Write for Illustrated Catalog No. 20.
Race & McComas Sts., Baltimore, Md.

RAMAPO AJAX CORPORATION
Ramapo Automatic Return Switch Stands for Passing Sidings
RACOR
TRADE MARK
RACOR Tee Rail Special Work.
Manganese Construction
GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

METAL SAFETY CROSS TIES
Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.
REVOLUTIONIZES ROADBEDS
Write for descriptive folder and quotation.
METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

Paint up for prosperity with

BECKWITH-CHANDLER
Highest Grade Car Finishes

Economical, durable,—especially compounded to meet exacting service conditions.
For Brush or Spray Application.
Flat Color and Varnish Systems.
Enamel Systems.
Color Varnish Systems.

Used by leading operators everywhere for interiors and exteriors.

Full information on request.

Beckwith-Chandler Co.
193-211 Emmett St., Newark, N. J.
320 Fifth Ave., New York

PERFECT MICANITE INSULATOR
Reg. U. S. Pat. Off.

ELECTRICAL INSULATION

Micanite armature and commutator insulation, commutator segments and rings, plate, tubes, etc., Empire oiled insulating materials; Linotape; Kablak; Mico; and other products—for the electrical insulating requirements of the railway.

Catalogs will gladly be furnished

MICA INSULATOR COMPANY
Sole Manufacturers of Micanite
Established 1893
68 Church St., New York 542 So. Dearborn St., Chicago
Works: Schenectady, N. Y.
9-F

A Single Segment or a Complete Commutator

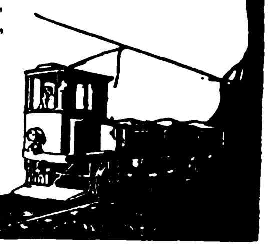
is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

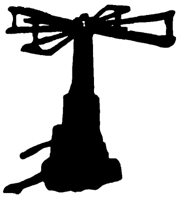
Cameron Electrical Mfg. Co., Ansonia, Connecticut

The Differential Car

An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.

The Differential Steel Car Co.
Findlay, Ohio





Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars
Perey Manufacturing Co., Inc.
30 Church Street, New York City

BUCKEYE JACKS
high-grade R. R. Track and Car Jacks
The Buckeye Jack Mfg. Co.
Alliance, Ohio

ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.

Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

FOSTER SUPERHEATERS

A necessity for turbine protection, engine cylinder economy and utilization of superheat for all its benefits

POWER SPECIALTY COMPANY, 111 BROADWAY, NEW YORK
Boston Philadelphia Pittsburgh Detroit Kansas City Dallas Chicago San Francisco London, Eng.

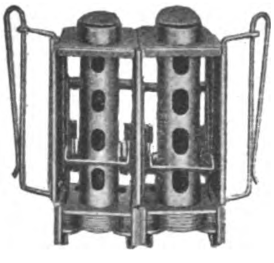
OHMER
FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

JOHNSON Universal Changer



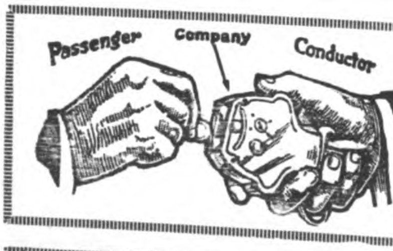
Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.



Direct
Automatic
Registration
By the
Passengers

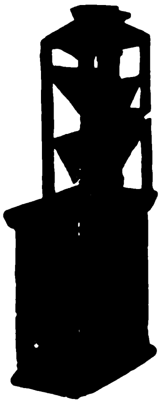
Rooke Automatic
Register Co.
Providence, R. I

SAMSON SPOT WATERPROOFED TROLLEY CORD

Trade Mark Reg. U. S. Pat. Off.

Made of extra quality stock firmly braided and smoothly finished. Carefully inspected and guaranteed free from flaws. Samples and information gladly sent.

SAMSON CORDAGE WORKS, BOSTON, MASS.



CLEVELAND
COLLECT
FARE BOXES
FARES BETTER

Given the details of construction and operation you at once realize its safety, simplicity, durability and flexibility.

The Cleveland Fare Box Co.
Cleveland, Ohio
Canadian Cleveland Fare Box Co., Ltd.
Preston, Ontario

193
IN
10224

Type R-10

International
Registers

Made in various types and sizes to meet the requirements of service on street and city system. Complete line of registers, counters and car fittings.

Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

Heywood-Wakefield
CAR SEATS
of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.
HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York, Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition

RAILWAY UTILITY COMPANY
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings.
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for Catalogue

1328 Broadway
New York, N. Y.

75% of the electric railways
use
B-V Punches

Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.

HALE-KILBURN
CAR SEATS
For Every Class of Service
General Offices and Works: Philadelphia
Offices: New York, Chicago, St. Louis, Washington, San Francisco

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches..............$4.50 an inch
4 to 7 inches.............. 4.30 an inch
8 to 14 inches.............. 4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E.R.J.

POSITIONS VACANT

SUPERINTENDENT of transportation wanted; must be good executive and disciplinarian and thoroughly familiar with handling city traffic. P-655, Electric Railway Journal, 10th Ave. at 36th St., New York.

WANTED: By a large special track work manufacturer in the East, a draftsman who has thorough knowledge of mathematics, particularly trigonometry and logarithms. P-658, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

POSITIONS WANTED

ARMATURE winder, 10 years' electrical experience, 7 years on railway motors, single, 30 years, willing to go anywhere. PW-652, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

AS CLAIM agent, or commerce attorney, age 38, married, Yale graduate in law, now employed, and have been for past five years, with short line, interstate road; specially qualified in Federal and State laws pertaining to railways in practice before the I. C. C. and State Commissions, as well as in the adjustment of claims. PW-661, Electric Railway Journal, 10th Ave. at 36th St., New York.

AS master mechanic or with chance for advancement; experienced low- and high-voltage d.c. equipment, passenger and freight, city and interurban; expert on motor and controller repairs. PW-656, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

AS supervisor of welding, bonding and grinding; four years' experience as travelling demonstrator of joint welding, shop welding, bonding, etc; two years' experience in all-around welding on a small road; have practical knowledge of track construction and repair; can guarantee supervision resulting in more efficiency, economy and a broader field of operation for all apparatus. Available about May 15. PW-663, Electric Railway Journal, 10th Ave. at 36th St., New York.

POSITIONS WANTED

GENERAL foreman, experienced on all branches of electric railroading, on city, and interurban cars, and locomotives, equipment. PW-665, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

SUPERINTENDENT of transportation at present with large successful property that has been placed on sound basis largely through efforts of advertiser, solicits correspondence with managers of city, suburban and interurban properties that require a capable progressive superintendent; 19 years' experience under high-grade executives on large properties; quick to locate leaks and correct same; fully competent to take over all details and build up an organization that would be a credit to any property. Successful in dealing with public and labor in a manner that will get results; will consider any good size property that requires extra effort to get results. Best of references. Personal reasons for desiring a change. PW-664, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

WANTED to locate with city or interurban railway in equipment, distribution, purchasing, construction, traffic and transportation or other capacity requiring engineering ability. Over ten years' experience in railway and power manufacturing, installation, operating. Your proposition solicited. PW-651, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

WANTED: Position as roadmaster and superintendent of overhead and maintenance ways; practical man on special work, welding, bonding and street paving. PW-667, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

WANTED: Position on small property where 21 years' experience in transportation, mechanical and safety departments could be used to advantage. Capable of filling supervisory position in these departments combined. PW-666, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

BARGAIN

13 Double End Equipments

General Electric MK Multiple Control.

Transit Equipment Company
Cars—Motors
501 Fifth Avenue, New York

BARGAIN PRICE
EXCELLENT CONDITION

ONE PORTABLE SUB-STATION

G. E. 250 kw. Now working on 33,000, 60 cy. line, 650 D.C., 1,200 r.p.m.

Photographs, price and further description on application.

Kansas City Kaw Valley & Western Ry. Co.
511 New Jersey Ave., Kansas City, Kansas.

FOR SALE

50—G. E. No. 80-A Motors.
50—Controllers, K-28-B; K-12.
35—B-2 Compressors.

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa

FOR SALE

50—Johnson Fare Boxes type D-M-2-
Two statements cash and tickets.
Good operating condition.

GRAND RAPIDS RAILWAY CO.,
42 Ionia Ave., Grand Rapids, Mich.

WANTED

6—One Man, Single Truck Safety Cars.

Double End Operation.

W-668, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

DESIGNERS AND DRAFTSMEN

The City of Philadelphia has adopted a program of transit development involving the design and construction, at this time, of approximately 6½ miles of four-track subway, 8½ miles of two-track subway, 3 miles of elevated road, and the necessary equipment, and is in immediate need of a large number of draftsmen, designers and designing engineers, qualified for this class of work and falling within the following classifications. Further requirements will be announced later.

Position	*Range in Compensation*
Assistant Engineers—Squad Boss (Design)	$3000—$3600
Senior Draftsmen—Structural, Electrical and Architectural	2700— 3000
Draftsmen—Structural, Electrical and Architectural	2100— 2500
Draftsmen—Structural, Electrical and Architectural	1500— 2000
Junior Draftsmen	1200— 1400

Apply to the Department of City Transit
1211 Chestnut Street, Philadelphia, Pa., for further particulars.

"Opportunity" Advertising:

Think "*SEARCHLIGHT*" First!

0097

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co
Westinghouse E. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Johnson & Co., J. R.
St. Louis Car Co.

Axles, Steel
Carnegie Steel Co.

Babbitt Metal
Ajax Metal Co.

Badges and Buttons
Elec. Service Supplies Co
Int. Register Co., The

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co

Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Consolidated Car Heat'g Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Boilers
Babcock & Wilcox Co.

Bond Testers
Amer. Steel & Wire Co.
Elec. Service Supplies Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Electric Railway Impt. Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Electric Railway Impt. Co
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Book Publishers
McGraw-Hill Book Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
American Bridge Co.
Bates Expanded Steel Truss Co.
Electric Ry. Equipment Co
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
National Ry. Appliance Co
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Br. Shoe & Fdy. Co
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co
National Brake Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Morganite Brush Co., Inc.
Westinghouse E. & M. Co.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.

Bus Seats
Hale-Kilburn Co.
Heywood-Wakefield Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Cables (See Wires and Cables)

Cambric Tapes, Yellow and Black Varnished
Irvington Varnish & Ins. Co
Mica Insulator Co.

Carbon Brushes (See Brushes, Carbon)

Car Panel Safety Switches
Consolidated Car Heat'g Co
Westinghouse E. & M. Co

Cars, Dump
Differential Steel Car Co.
St. Louis Car Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heat'g Co
Westinghouse E. & M. Co.

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co
St. Louis Car Co.
Wason Mfg. Co.

Cars, Gas Rail
St. Louis Car Co.

Cars, Self-Propelled
General Electric Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
Bemis Car Truck Co.
St. Louis Car Co.

Castings, Malleable and Bras.
Amer. Br. Shoe & Fdy. Co
Bemis Car Truck Co.
St. Louis Car Co.

Catchers and Retrievers, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Elec. Service Supplies Co.

Coils, Armature and Field
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
Intern'l Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co

Compressors, Air
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co

Compressors, Air Portable
Ingersoll-Rand Co.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Condenser Papers
Irvington Varnish & Ins. Co

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Consolidated Car Heat'g Co
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Conveying and Hoisting Machinery
Columbia M. W. & M. I. Co

Copper Wire
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., J. A
St. Louis Car Co.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Cranes
Allis-Chalmers Mfg. Co.
Universal Crane Co.

Cranes, Gas or Electric
Universal Crane Co.

Cranes, Locomotive, Motor Truck & Portable
Universal Crane Co.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co

Crossings
Ramapo Ajax Corp.

Crossing Signals (See Signals, Crossing)

Crossing, Frog & Switch
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

Crossing Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Anderson Mfg. Co., A.&J. M
Ohio Brass Co.

Curtains and Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co.
Transit Equip. Co.

Derailing Devices (See also Track Work)
Wharton, Jr., & Co., Wm.

Derailing Switches, Tee Rail
Ramapo Ajax Corp.

Detective Service
Wish-Service, P. Edward

Doors & Door Fixtures
Hale-Kilburn Co.
St. Louis Car Co.

Door Operating Devices
Brill Co., The J. G.
Consolidated Car Heat'g Co
General Electric Co.
Nat'l Pneumatic Co., Inc.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.

Ears
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.

Electrical Wires and Cables
Amer. Electrical Works
Roebling's Sons & Co., J. A.

Electric Grinders
Railway Track-work Co.
Rail Welding & Bonding Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbins, J. Rowland
Buchanan & Laying Corp.
Day & Zimmermann, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelly Cooke & Co.
Ong, Joe R.
Richey, Albert S.
Sanderson & Porter
Stevens & Wood, Inc.
Stone & Webster
White Eng. Corp., The J. G
Wortham, Edwin

Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E & M. Co.

Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Star Brass Works

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Flangeway Guards, Steel
Godwin Co., Inc., W. S.

Flaxlinum Insulation
Nat'l Ry. Appliance Co.

Floodlights
Elec. Service Supplies Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.

Funnel Castings
Wharton, Jr., Inc., & Co., Wm.

Fuses and Fuse Boxes
Consolidated Car Heat'g Co.
General Electric Co.
Westinghouse E. & M. Co.

Fuses, Refillable
General Electric Co.

Gaskets
Power Specialty Co.
Westinghouse Tr. Br. Co.

Gas-Electric Cars
General Electric Co.

Gas Producers
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.

Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gong (See Bells and Gongs)

Graphite
Morganite Brush Co., Inc.

Greases (See Lubricants)

Grinders and Grind. Supplies
Metal & Thermit Corp.
Railway Track-work Co.

Grinders, Portable
Buda Company
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Blocks and Wheels
Railway Track-work Co

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

Guards, Cattle
American Bridge Co.

Guards, Trolley
Elec. Service Sup. Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., E. D.
Star Brass Works
Thornton Trolley Wheel Co.

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Heaters, Car (Electric)
Consolidated Car Heat'g Co.
Gold Car Heat. & Light. Co.
Nat'l Ry. Appliance Co., P.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Elec. Service Sup. Co.
Smith Heater Co., Peter

Helmets—Welding
Railway Track-work Co.

Hoists, Portable
Ingersoll-Rand Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating Signals
Oskel Equipment Co.

Instruments, Measuring, Testing and Recording
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Insulating Cloth, Paper and Tape
General Electric Co
Irvington Varnish & Ins. Co
Mica Insulator Co.
Mitchel-Rand Mfg. Co.
Okonite Co.
Stand. Underground Cable Co.
Westinghouse E. & M. Co.

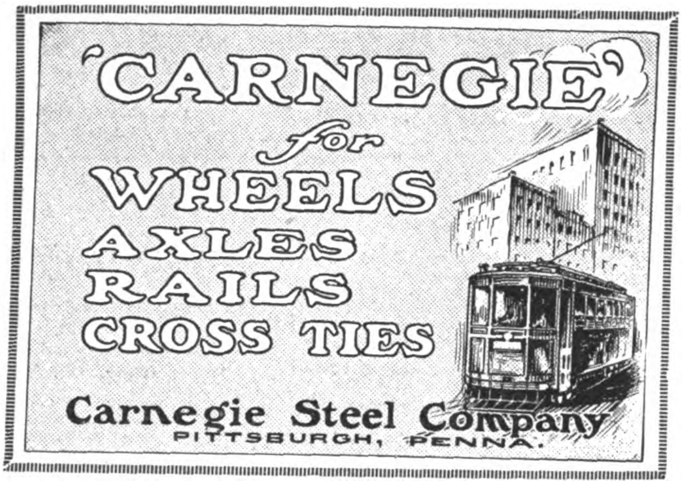
Insulating Silk
Irvington Varnish & Ins. Co

Insulating Varnishes
Irvington Varnish & Ins. Co

Insulation (See also Paints)
Anderson, M. Co., A. & J. M.
Electric Ry. Equipment Co
Electric Service Sup. Co.
General Electric Co.
Irvington Varnish & Ins. Co
Mica Insulator Co.
Mitchel-Rand Mfg. Co.
Okonite Co.
Westinghouse E. & M. Co.

Insulation Slot
Irvington Varnish & Ins. Co

Insulators (See also Line Material)
Aderson, M. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co
Ohio Brass Co
Westinghouse E & M. Co


CARNEGIE
for
WHEELS
AXLES
RAILS
CROSS TIES
Carnegie Steel Company
PITTSBURGH, PENNA.

Waterproofed Trolley Cord

SILVER LAKE A

Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.

FOR POSITIVE SATISFACTION ORDER SILVER LAKE

If you are not familiar with the quality you will be surprised at its **ENDURANCE** and **ECONOMY.**

Sold by Net Weights and Full Lengths

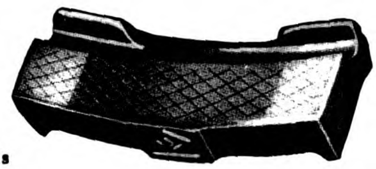
SILVER LAKE COMPANY
Manufacturers of bell, signal and other cords.
Newtonville, Massachusetts

Brake Shoes
A.E.R.A. Standards

Diamond "S" Steel Back is the Best Type

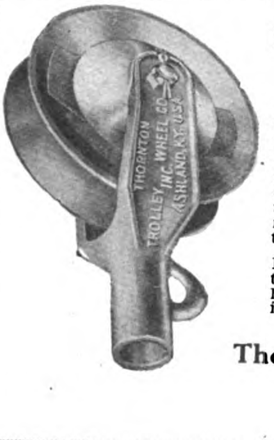
Standard Patterns for

SAFETY CAR



D-67 for Narrow Treads
D-87 for Wide Treads

American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

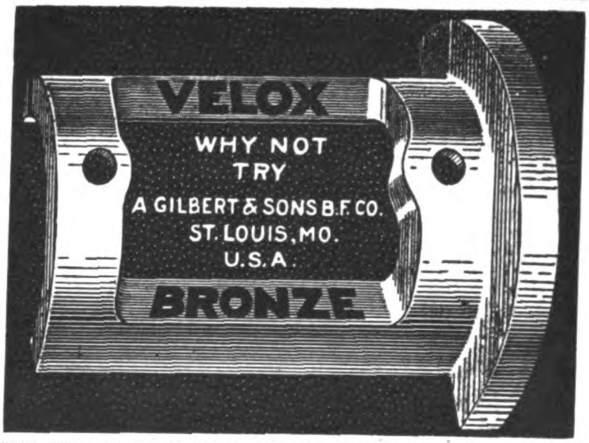

THORNTON
TROLLEY INC. WHEEL CO.
ASHLAND, KY. U.S.A.

He expects more than 100,000 miles

Mr. Bickle, Chief Motor Inspector of the Louisville Railway Company, says: "All of the Thornton Side Bearings we have tried out are still in use and in fine condition. Some of them have made close to 50,000 miles and it looks like they might make more than double that mileage before we have finished the test."

Did you ever hear of such service? Get the facts about this noiseless, vibrationless, perfectly balanced and longer lasting trolley device.

Thornton Trolley Wheel Co.
Incorporated
Ashland, Kentucky


VELOX
WHY NOT
TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED

No. 478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y

IN THE REPAIR SHOPS
There are many cars *not* equipped with

AJAX
M.C.B.
3¾X7

AJAX CAR BRASSES

The cars that *are* equipped with Ajax Brasses keep on the road, day after day

The Ajax Metal Company
Established 1880
Philadelphia, Pa.
NEW YORK CHICAGO BOSTON CLEVELAND

PS HEATERS

Car Heating and Ventilation

are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment Now is the time to get your cars ready for next winter. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.
Insulators, High Voltage
Lapp Insulator Co., Inc.
Jacks (See also Cranes, Hoists and Lifts)
Buda Company
Elec. Service Supplies Co.
Joints, Rail (See Rail Joints)
Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.
Junction Boxes
Std. Underground Cable Co.
Lamps, Guards and Fixtures
Anderson M. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
Lamps, Arc & Incandescent (See also Headlights)
General Electric Co.
Westinghouse E. & M. Co.
Lamps, Signal and Marker
Nichols-Lintern Co.
Lanterns, Classification
Nichols-Lintern Co.
Lightning Protection
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.
Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson, M. Co., A. & J. M.
Archbold-Brady Co.
Columbia M. W. & M. I. Co.
Electric Ry Equipment Co.
Elec. Service Sup. Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Locking Spring Boxes
Wharton, Jr., & Co., Wm.
Locomotives, Electric
Baldwin Locomotive Wks.
General Electric Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
Lubricating Engineers
Galena Signal Oil Co.
Universal Lubricating Co.
Lubricants, Oil and Grease
Galena-Signal Oil Co.
Universal Lubricating Co.
Machinery, Insulating
Amer. Insulating Mach. Co.
Manganese Steel Castings
Wharton, Jr., & Co., Wm.
Manganese Steel Guard Rails
Ramapo Ajax Corp.
Manganese Steel Switches, Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.
Manganese Steel, Special Track Work
Bethlehem Steel Co.
Wharton, Jr., & Co., Wm.
Meters (See Instruments)
Mica
Mica Insulator Co.
Molding, Metal
Allis-Chalmers Mfg. Co.
Motor Buses (See Buses, Motor)
Motors, Electric
Westinghouse E. & M. Co.
Motors and Generator Sets
General Electric Co.
Motormen's Seats
Allis-Chalmers Mfg. Co.
Brill Co., J. G.
Elec. Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.
Nuts and Bolts
Barbour-Stockwell Co.
Bethlehem Steel Co.
Bemis Car Truck Co.
Hubbard & Co.
Oils (See Lubricants)
Omnibuses (See Buses, Motor)
Oxy-Acetylene (See Cutting Apparatus Oxy-Acetylene)
Packings
Power Specialty Co.
Paints and Varnishes (Insulating)
Mica Insulator Co
Mitchel-Rand Mfg. Co.
Paints & Varnishes (Preservatives)
Beckwith-Chandler Co
Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co.
Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co, Inc., W. S.
Paving Material
Amer. Br. Shoe & Fdy. Co.
Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.
Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.
Pinions (See Gears)
Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.
Pipe Fittings
Power Specialty Co.
Westinghouse Tr. Brake Co.
Planers (See Machine Tools)
Plates for Tee Rail Switches
Ramapo Ajax Corp.
Pliers, Rubber Insulated
Elec. Service Sup. Co.
Pneumatic Tools
Ingersoll-Rand Co.
Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.
Poles, Metal Street
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Hubbard & Co.
Pole Reinforcing
Hubbard & Co.
Poles & Ties Treated
Baker Wood Preserving Co.
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.
Poles, Ties, Posts, Piling & Lumber
Baker Wood Preserving Co.
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.
Poles, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
Nuttall Co., R. D.
Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.
Porcelain, Special High Voltage
Lapp Insulator Co., Inc.
Potheads
Okonite Co.
Power Saving Devices
National Ry. Appliance Co
Pressure Regulators
General Electric Co.
Westinghouse E. & M. Co
Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Pumps, Vacuum
Ingersoll-Rand Co.
Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.
Rail Braces & Fastenings
Ramapo Ajax Corp.
Rail Grinders (See Grinders)
Rail Joints
Carnegie Steel Co.
Rail Joint Co., The
Rail Joints—Welded
Lorain Steel Co.
Metal & Thermit Corp.
Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Railway Paving Guards, Steel
Godwin Co., Inc., W. S.
Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.
Rail Welding
Metal & Thermit Corp.
Railway Track-work Co.
Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Rooke Automatic Register Co.
St. Louis Car Co.
Reinforcement, Concrete
Amer. Steel & Wire Co.
Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

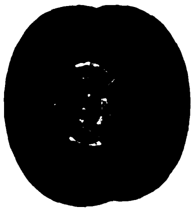
Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.
Replacers, Car
Elec. Service Sup. Co.
Resistances
Consolidated Car Heat. Co.
Resistance, Wire and Tube
General Electric Co.
Westinghouse E. & M. Co.
Retrievers, Trolley (See Catchers and Retrievers, Trolley)
Rheostats
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co.
Sanders, Track
Brill Co. The J. G.
Elec. Service Supplies Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.
Sash Fixtures, Car
Brill Co, The J. G.
St. Louis Car Co.
Sash, Metal, Car Window
Hale-Kilburn Co.
Scrapers, Track (See Cleaners and Scrapers, Track)
Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.
Seats, Bus
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Seats, Car (See also Rattan)
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
St. Louis Car Co.
Second Hand Equipment
Electric Equipment Co.
Transit Equip. Co.
Shades, Vestibule
Brill Co., The J. G.
Shovels
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.
Side Bearings (See Bearings Center and Side)
Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.
Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.
Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc
U. S. Elec. Signal Co.
Wood Co., Chas. N.
Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
U. S. Elec. Signal Co.
Slack Adjusters (See Brake Adjusters)
Sleet Wheels and Cutters
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Smokestacks, Car
Nichols-Lintern Co.
Snow Sweepers, Rattan
Heywood-Wakefield Co.
Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Special Adhesive Papers
Irvington Varnish & Ins. Co.
Special Trackwork
Bethlehem Steel Co.
Buda Company
Lorain Steel Co.
Spikes
Amer. Steel & Wire Co.
Splicing Compounds
Westinghouse E. & M. Co.
Splicing Sleeves (See Clamps and Connectors)
Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Steel Castings
Wharton, Jr., & Co., Wm.
Steel and Steel Products
Morton Mfg. Co.

Steps, Car
Morton Mfg. Co.
Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.
Stop Signals
Oskel Equipment Co.
Storage Batteries (See Batteries, Storage)
Strain, Insulators
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.
Strand
Roebling's Sons Co., J. A.
Superheaters
Babcock & Wilcox Co.
Power Specialty Co.
Sweepers, Snow (See Snow Plows, Sweepers and Brooms)
Switch Stands & Fixtures
Ramapo Ajax Corp.
Switches, Selector
Nichols-Lintern Co.
Switches, Tee Rail
Ramapo Ajax Corp.
Switches, Track (See Track Special Work)
Switches and Switchboards
Allis-Chalmers Mfg Co.
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Tampers, Tie
Ingersoll-Rand Co.
Railway Track-work Co.
Tapes and Cloths (See Insulating Cloth, Paper and Tape)
Tee Rail Special Track Work
Bethlehem Steel Co
Ramapo Ajax Corp.
Telephones and Parts
Elec. Service Supplies Co.
Terminals, Cable
Std. Underground Cable Co.
Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)
Thermostats
Consolidated Car Heat. Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter
Ticket Choppers & Destroyers
Elec. Service Supplies Co.
Ties, All Metal
Metal Safety R.R. Tie Co.
Ties and Tie Rods, Steel
Barbour-Stockwell Co.
Carnegie Steel Co
International Steel Tie Co.
Ties, Wood Cross (See Poles, Ties, Posts, etc.)
Tongue Switches
Wharton, Jr., & Co., Wm.
Tool Steel
Bethlehem Steel Co.
Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.
Torches, Acetylene (See Cutting Apparatus)
Towers and Transmission Structures
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Westinghouse E. & M. Co.
Track Expansion Joints
Wharton, Jr., & Co., Inc., Wm.
Track Grinders
Metal & Thermit Corp.
Railway Track-work Co.
Rail Welding & Bonding Co.
Trackless Trolley Cars
St. Louis Car Co.
Track, Special Work
Barbour-Stockwell Co.
Bethlehem Steel Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., W.
Transfer (See Tickets)
Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.
Treads, Safety, Stair, Car Step
Morton Mfg. Co.
Trolley Bases
Anderson Mfg. Co., A. J. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.
Trolley Bases, Retrieving
Anderson Mfg. Co., A. & J. M.

Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.
Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co
Trolley Material
Bates Expanded Steel Truss
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Trolley Wheel Bushings
More-Jones Brass & Metal Co.
Trolley Wheels and Harps
More-Jones Brass & Metal Co.
Thornton Trolley Wheel Co
Trolley Wheels (See Wheels, Trolley)
Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co
Page Steel & Wire Co.
Roebling's Sons Co., J. A
Thornton Trolley Wheel Co
Trucks, Car
Baldwin Locomotive Works
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Tubing, Yellow & Black, Flexible Varnish
Irvington Varnish & Ins. Co.
Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.
Turnstiles
Elec. Service Supplies Co.
Perey Mfg. Co., Inc.
Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.
Varnished Papers
Irvington Varnish & Ins. Co.
Varnished Silks
Irvington Varnish & Ins. Co.
Varnishes
Beckwith-Chandler Co.
Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.
Welded Rail Joints
Electric Railway Impt. Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Track-work Co.
Welders, Portable Electric
Electric Railway Impt. Co
Ohio Brass Co.
Railway Track-work Co.
Welding Processes and Apparatus
General Electric Co.
Electric Railway Impt. Co.
International Oxygen Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.
Welding Steel
Electric Railway Impt. Co.
Railway Track-work Co.
Wheel Guards (See Fenders and Wheel Guards)
Wheel Presses (See Machine Tools)
Wheels, Car Steel & Steel Tire
Carnegie Steel Co.
Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Gilbert & Sons, B. F. A
More-Jones Brass & Metal Co.
Wheels, Trolley, Wrought Steel
Elec. Service Supplies Co.
General Electric Co.
Nuttall Co., R. D.
Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Wire Rope
Amer Steel & Wire Co
Roebling's Sons Co., J.A.
Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co
General Electric Co
Okonite Co.
Roebling's Sons Co., J. A.
Std. Underground Cable Co.
Westinghouse E. & M. Co.
Wood Preservatives
Baker Wood Preservative Co.

The Kalamazoo Trolley Wheels

have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

B. A. HEGEMAN, Jr., President — C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. — F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.

Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

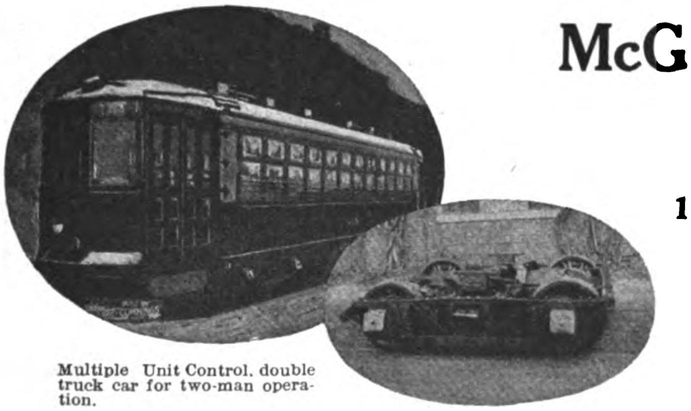
You're having brush trouble

CORRECT IT
USE LE CARBONE CARBON BRUSHES

They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto



Multiple Unit Control, double truck car for two-man operation.

McGUIRE-CUMMINGS
Manufacturing Company

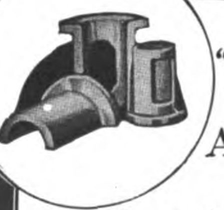
General Offices
111 W. Monroe St., Chicago, Ill.

Street Cars
Trucks

TULC A LUBRICANT

We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC on your equipment

The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City



MORE-JONES "TIGER-BRONZE" AXLE AND ARMATURE BEARINGS

Not always the cheapest, but ever lowest in ultimate cost

MORE-JONES BRASS & METAL CO.
St. Louis, Missouri.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page

A

Ajax Metal Co 37
Allis-Chalmers Mfg. Co 33
Allison & Co., J. E 20
Amer. Brake Shoe & Fdy. Co .. 37
American Car Co 41
American Electrical Works 30
American Insulating Mach. Co .. 30
American Steel & Wire Co 31
Anaconda Copper Mining Co ... 30
Anderson Mfg. Co., A. & J. M .. 26
Archbold-Brady Co 21
Arnold Co., The 20

B

Babcock & Wilcox Co 32
Baker Wood Preserving Co 30
Baldwin Locomotive Works 27
Barbour-Stockwell Co 31
Bates Expanded Steel Truss Co .. 12
Beckwith-Chandler Co 33
Beeler, John A 20
Bell Lumber Co 40
Bemis Car Truck Co 23
Bethlehem Steel Co 31
Bibbins, J. Rowland 21
Bonney-Vehslage Tool Co 34
Brill Co., The J. G 41
Buchanan & Layng Corporation. 21
Buckeye Jack Mfg. Co 33
Buda Co. 31

C

Cameron Electric Mfg. Co 33
Carnegie Steel Co 37
Chillingworth Mfg. Co 40
Cleveland Fare Box Co 34
Collier, Inc., Barron G 22
Consolidated Car Fender Co 40
Consolidated Car Heating Co .. 40

D

Day & Zimmermann, Inc 20
Differential Steel Car Co., The .. 33
Drum & Co., A. L 21

Page

E

Electric Equipment Co 35
Electric Railway Equipment Co. 32
Electric Railway Improvement Co. 32
Electric Service Supplies Co 9

F

Ford, Bacon & Davis 20
"For Sale" Ads 35

G

Galena-Signal Oil Co 13
General Electric Co...14, Back Cover
Gilbert & Sons, A 37
Godwin Co., Inc., W. S 32
Gold Car Heating & Ltg. Co 37

H

Hale-Kilburn Co 34
"Help Wanted" Ads 35
Hemphill & Wells 20
Heywood-Wakefield Co 34
Holst, Englehardt W 20
Hubbard & Co 30

I

Ingersoll-Rand Co ...... Front Cover
International Creosoting & Construction Co. 10
International Register Co., The .. 34
International Steel Tie Co 7
Irvington Varnish & Insulator Co. 32

J

Jackson, Walter 20
Jeandron, W. J 39
Johnson & Co., J. R 40
Johnson Fare Box Co 34

K

Kelly, Cooke & Co 20
Kuhlman Car Co 41

Page

L

Lapp & Co 30
Le Carbone Co 39
Lorain Steel Co 31

M

McGraw-Hill Book Co 21
McGuire-Cummings Mfg. Co 39
Metal & Thermit Corp 25
Metal Safety Railway Tie Co ... 32
Mica Insulator Co 33
Mitchell Rand Mfg. Co 28
More-Jones Brass & Metal Co .. 39
Morganite Brush Co., Inc 26
Morton Mfg. Co 40

N

Nachod Signal Co., Inc 30
National Brake Co 19
National Pole Co 8
National Pneumatic Co., Inc ... 11
National Railway Appliance Co. 39
N. Y. Switch & Crossing Co 31
Nichols-Lintern Co 21
Nuttall Co., R. D 29

O

Ohio Brass Co 5
Ohmer Fare Register Co 34
Okonite Co., The 32
Ong, Joe R 21
Oskel Equipment Co 40

P

Parsons, Klapp, Brinckerhoff & Douglas 20
Perey Mfg. Co., Inc 33
Positions Wanted & Vacant 35
Power Specialty Co 33

R

Rail Joint Co 31
Railway Track-work Co 4

Page

Railway Utility Co 34
Ramapo Ajax Co 32
Richey, Albert S 20
Roebling's Sons Co., John A ... 30
Rooke Automatic Register Co .. 34

S

St. Louis Car Co 29
Samson Cordage Works 34
Sanderson & Porter 20
Searchlight Section 35
Shaw, Henry M 32
Smith Heater Co., Peter 37
Silver Lake Co 37
Standard Underground Cable Co. 30
Star Brass Works 39
Stevens & Wood, Inc 20
Stone & Webster 20
Stucki Co., A 40

T

Thornton Trolley Wheel Co 37
Tool Steel Gear & Pinion Co., The 27
Transit Equip. Co 35

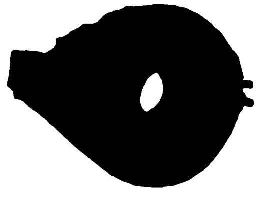
U

U. S. Electric Signal Co 30
Universal Crane Co 32
Universal Lubricating Co 39

W

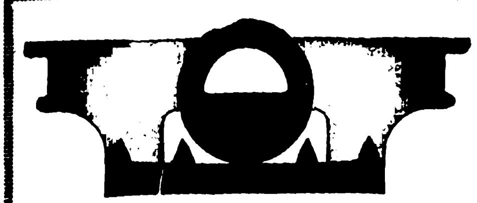
"Want" Ads 35
Wason Mfg. Co 41
Westinghouse Electric & Mfg. Co. 2
Westinghouse Traction Brake Co. 6
Wharton, Jr., Co., Wm 25
White Engineering Corp., J. G .. 20
Wish Service, The P. Edw 21
Wood Co., Chas. N 30
Wortham, Edwin 21

100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago


CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. Write Us.
Chillingworth Mfg. Co.
Jersey City, N. J.

ELECTRIC CAR HEATERS
THERMOSTATS BUZZERS
PNEUMATIC DOOR OPERATORS
CONSOLIDATED CAR HEATING CO.
NEW YORK
ALBANY, N.Y.
CHICAGO

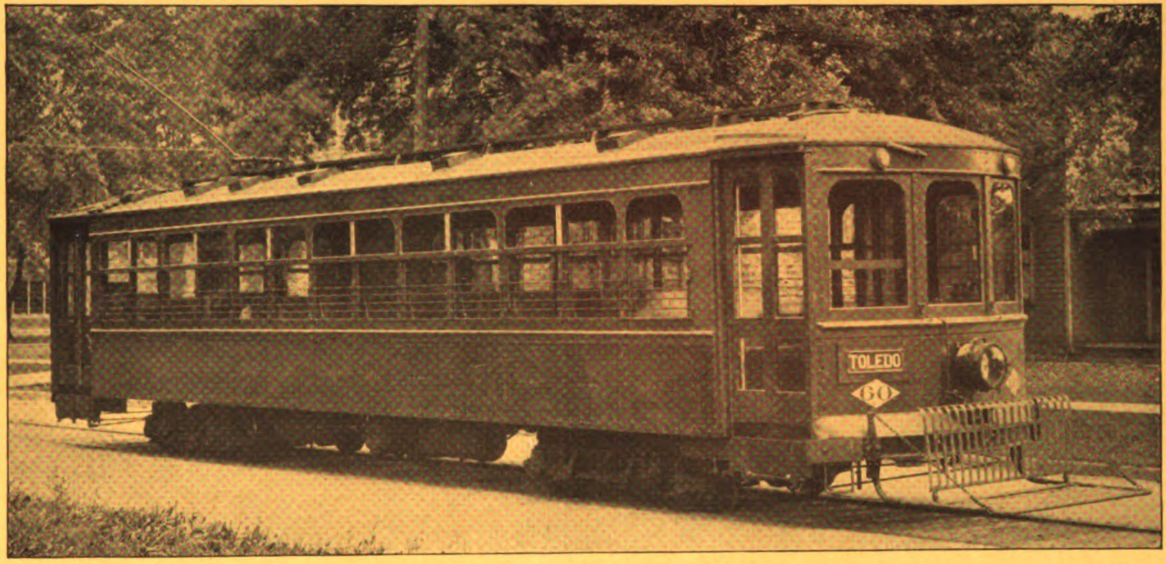
PROVIDENCE FENDERS
H-B LIFE GUARDS
The Consolidated Car Fender Co., Providence, R. I.
Wendell & MacDuffie Co., 110 E. 42nd St., New York
General Sales Agents


STUCKI
SIDE
BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

"OSKELITE"
The Stop Light for street cars. Operates from brake system. Details on request.
The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.



Light-Weight— High-Speed—

Combination Passenger, Smoking and Baggage Interurban Car

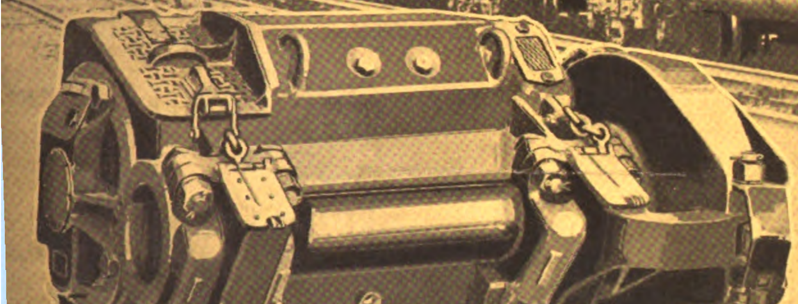
This type of light-weight interurban car recently placed in operation by the Northwestern Ohio Railway & Power Company was designed to furnish a high-speed service in which passenger convenience and comfortable riding are most important, at the same time being consistently light in weight to take advantage of low operating costs. Total weight is 36,420 lb.

It measures 47 ft. 4¼ in. long over bumpers, 8 ft. 4 in. wide inside, and is mounted on Brill 77-E1 trucks, equipped with twin swing links for high-speed service.

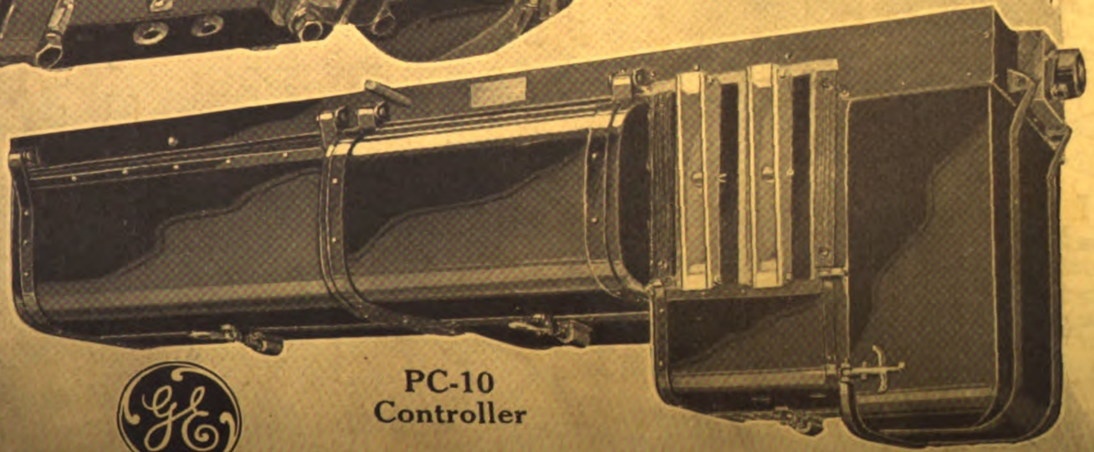
The location of the passenger compartment in the forward end and absence of front bulkheads provides a most pleasant outlook for passengers in this main compartment.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. ST. LOUIS MO. — G. C. KUHLMAN CAR CO. CLEVELAND, OHIO — WASON MANF'G CO. SPRINGFIELD MASS.

r train equipped with
-243 Motors and PC-10 Control



GE-243
Motor



PC-10
Controller

On the Chicago Elevated

The rapid-transit lines which haul Chicago's millions use GE-243 Motors.

Recently 60 new GE-243 Motors were placed in service. These are duplicates of more than 325, which have been operating successfully since 1915.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

25-231

GENERAL ELECTRIC

Annual Maintenance Number

ELECTRIC RAILWAY JOURNAL

TF
701
.E7

McGraw-Hill Co., Inc.
March 22, 1924
Twenty Cents Per Copy

PROPERTY OF
TECHNICAL PUBLICATIONS LIBRARY
U. OF VA. SCHOOL OF ENGINEERING

Heavier than Air Facts on STEEL TIE TRACK

First Installation 1910, Altoona—Open Track—Service; 20 ton cars, fifteen minute headway for nineteen hours per day. Engineer says: "There is no apparent deterioration with Steel Ties."

Installation Anderson, Indiana, 1911—City and Interurban.—Traffic check 13,458,960 ton-wheels. Engineer says: "None of track shown, nor any of this type of construction on our property, has cost anything for maintenance since it was installed."

Our largest and oldest user (first installation 1911) has standardized on Steel Twin Ties for all new construction and reconstruction.

A two year old test renewal installation has demonstrated that new rail and paving may be placed on old Steel Tie Foundation.—34th Street Bridge, Broadway Line, Cleveland, Ohio.

Write for proposal folder, including delivered price.

The INTERNATIONAL
STEEL TIE COMPANY
CLEVELAND, OHIO

Steel Twin Tie Track

Buying Reduced Maintenance

THINK!

The equipment that you buy today must be maintained tomorrow. What will be the result of your purchase?

Will there be a never-ending stream of troubles from parts broken in service, or worn out prematurely due to inaccessibility, or will your new equipment be sufficiently sturdy and accessible, so that with normal maintenance, it will last for the life of the car?

When you purchase good equipment you can expect good service. When it is maintained with good parts you can expect long life.

The right kind of maintenance means economy. Economy in maintenance involves systematic inspection and overhauling. Systematic maintenance means reliable service.

Westinghouse equipment maintained with Westinghouse parts will give you unequalled satisfaction.

W
WESTINGHOUSE ELECTRIC

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

Vol. 63, *No.* 12 New York, March 22, 1924 *Pages* 439-488

ELECTRIC RAILWAY JOURNAL

MORRIS BUCK
Associate Editor

C. W. SQUIER
Associate Editor

JOHN A. MILLER, JR.
Assistant Editor

G. J. MACMURRAY
News Editor

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago

MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago

CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 439

40 per Cent Are Over 20 Years Old..................441

Only 28 per cent of all machine tools now in use in electric railway shops have been purchased in the last ten years. JOURNAL'S survey of conditions shows that at least 12,500 new machine tools are needed to approach modernization in this department of the industry.

Acid in Lubricating Oil Reduces Friction..............443

How Modern Machine Tools Cut Costs.................444

Multiple-cut, low-swing lathes reduce time for machining axles to one-quarter of that required with other type machines. Finishing axle surfaces by grinding reduces time by 25 per cent. New type boring mill turns out twice as many wheels per day as the average in most shops.

Special Handling Equipment.........................455

A picture story is presented in this issue showing many uses to which the equipment is put in electric railway work.

Keeping Track Machinery "on the Job"................463

Trace maintenance and reconstruction in Milwaukee expedited by the use of a large variety of machine equipment in charge of a special division. Each job is charged at predetermined rental rates to cover equipment costs.

Line Practices on Pittsburgh Railways................469

BY H. A. PHARO.

The materials, construction and equipment used by this large system, together with the maintenance and emergency organization employed, are briefly and helpfully discussed. Recent stolen tests merit of line department's work.

Equipment Maintenance Notes.......................473

New Equipment Available...........................475

American Association News.........................478

News of the Industry...............................479

Financial and Corporate............................483

Personal Notes 486

Manufactures and the Markets.......................487

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

1924

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingenieria Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

Copyright, 1924, by McGraw-Hill Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

Annual Reports

THIS is the open season for annual reports. A great share of electric railway companies have a fiscal year coinciding with the calendar year and hence the flood of reports at this time of the year.

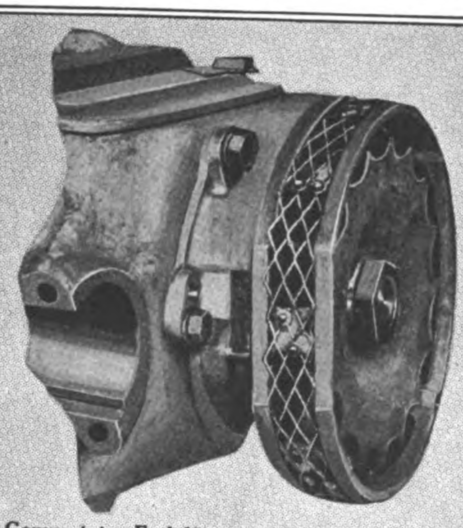
A feature of ELECTRIC RAILWAY JOURNAL service for many years has been the presentation of these reports in the "Financial and Corporate" department. They are presented in as complete form as space limitations permit, but in any event the principal financial and operating statistics contained in them are published, together with any unusual conditions mentioned relating to the property's showing.

This puts in handy form, right in the same cover with the other regular features of the paper, a file of the reports of practically all the important companies in the United States and Canada, and many of the minor ones.

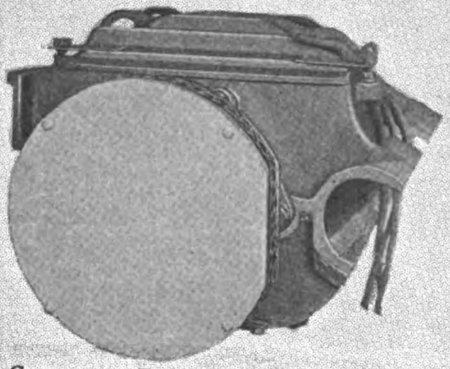
Long after the original reports have been mislaid, these abstracts are available in the back numbers of the JOURNAL, and time after time they have fulfilled the needs of railway and financial men the country over. This simply goes to show that the JOURNAL pictures comprehensively the financial aspects as well as every other phase of the industry.

Number of Copies Printed, 7,500 Advertising Index—Alphabetical, 158; Classified, 152, 154, 156; Searchlight Section, 151

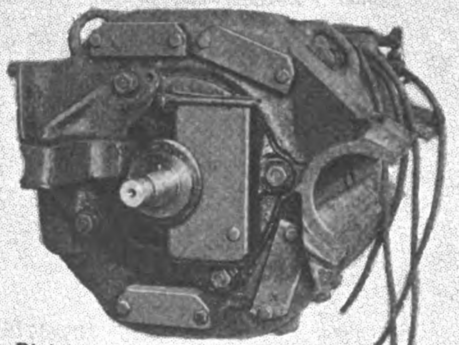
The External Fan



Commutator-End Housing and Fan Chamber Showing External Fan.



Commutator-End Housing with Protecting Cover in place.



Pinion End of Motor, showing Air Intake Openings with covers in place.

30 to 50 Percent Increase in Capacity

follows the application of Westinghouse External Fans to your non-ventilated railway motors.

This increase in rating is accomplished by mounting the fan, enclosed in a special housing, on an extension of the shaft at the commutator end.

The only factors that limit the diameter of the external fan are the clearances of the axle collar and the wheel hub.

The effectiveness of this method of ventilation lies in the quantity of air which is drawn through the commutator-end housing.

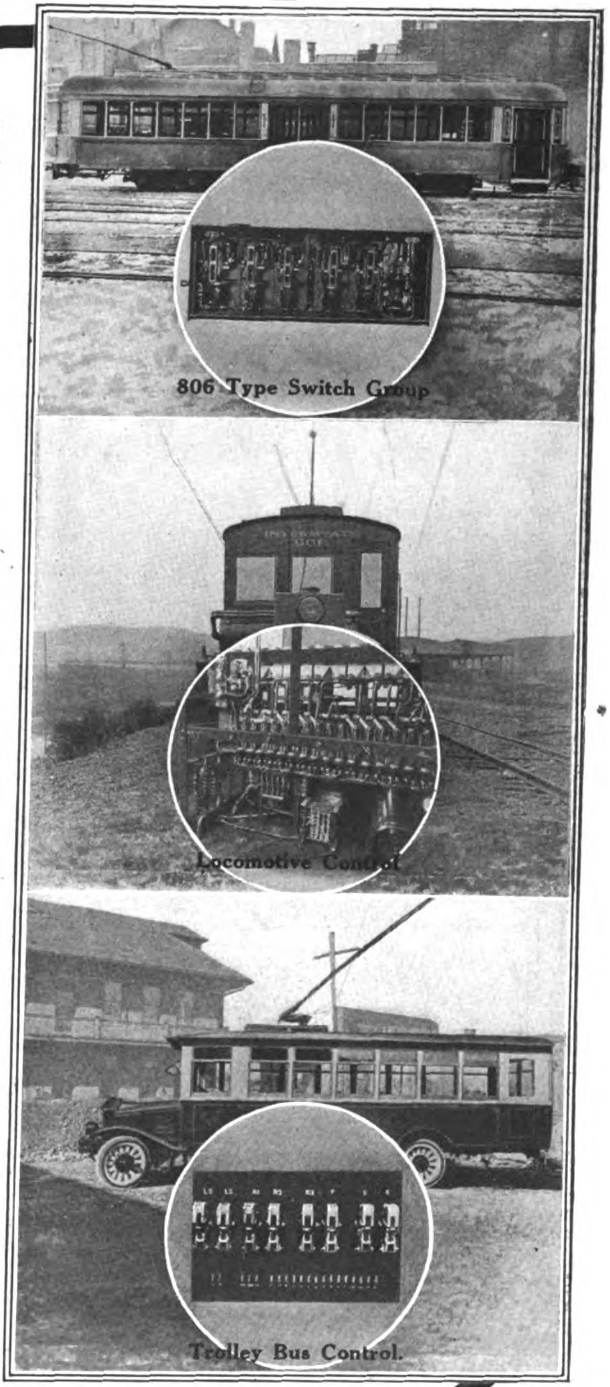
All the tools needed to equip your non-ventilated motors with Westinghouse External Fans are to be found in almost every electric railway shop.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.
Sales Offices in All Principal Cities of the
United States and Foreign Countries

W
WESTINGHOUSE
ELECTRIC

Westinghouse

The Proof of the Equipment is in the Maintenance Cost



In buying equipment for new rolling stock, it is necessary to consider such characteristics as capacity, serviceability, comfort, appearance, LAST COST and, lastly, first cost.

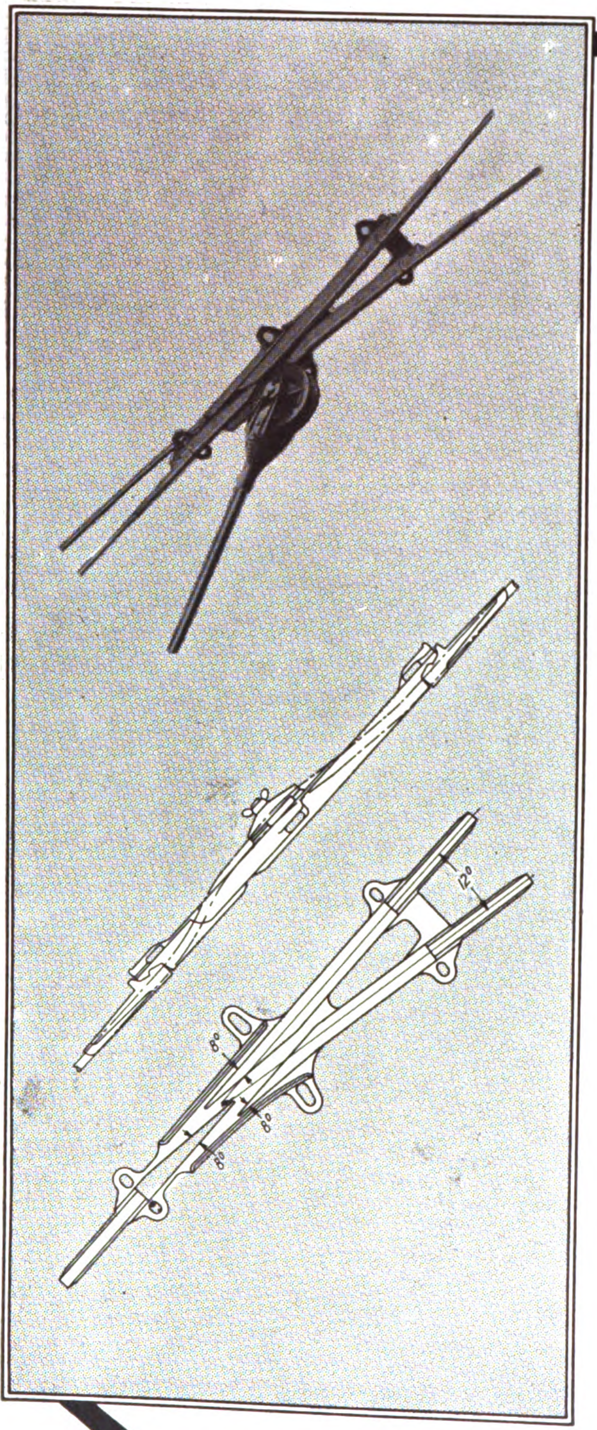
There is some Westinghouse equipment operating near you. Your inspection is invited. Note particularly the accessibility of low-floor HL control for light-weight, multiple-unit cars, HL unit-switch control for locomotives, and unit-switch control for trolley buses.

W
WESTINGHOUSE
ELECTRIC

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.
Sales Offices in All Principal Cities of the
United States and Foreign Countries

Westinghouse

Line Material



W
WESTINGHOUSE
ELECTRIC

A New Trolley Frog
Westinghouse CF
with Bayonet Approach

Note the following:

CF frogs can be installed and replaced without the use of any tool, except a line tool and pliers.

The frog can be placed close enough to its switch point so as to avoid any trolley line wear.

The trolley-wheel contact during the entire travel is on the ridges of the frog. This gives longer life to both the frog and the trolley wheel.

The approaches are extra long and flexible and are quickly installed.

The bridge is low, making the bend in the trolley wire extremely small.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.
Sales Offices in All Principal Cities of the
United States and Foreign Countries

Westinghouse

Insulating Material

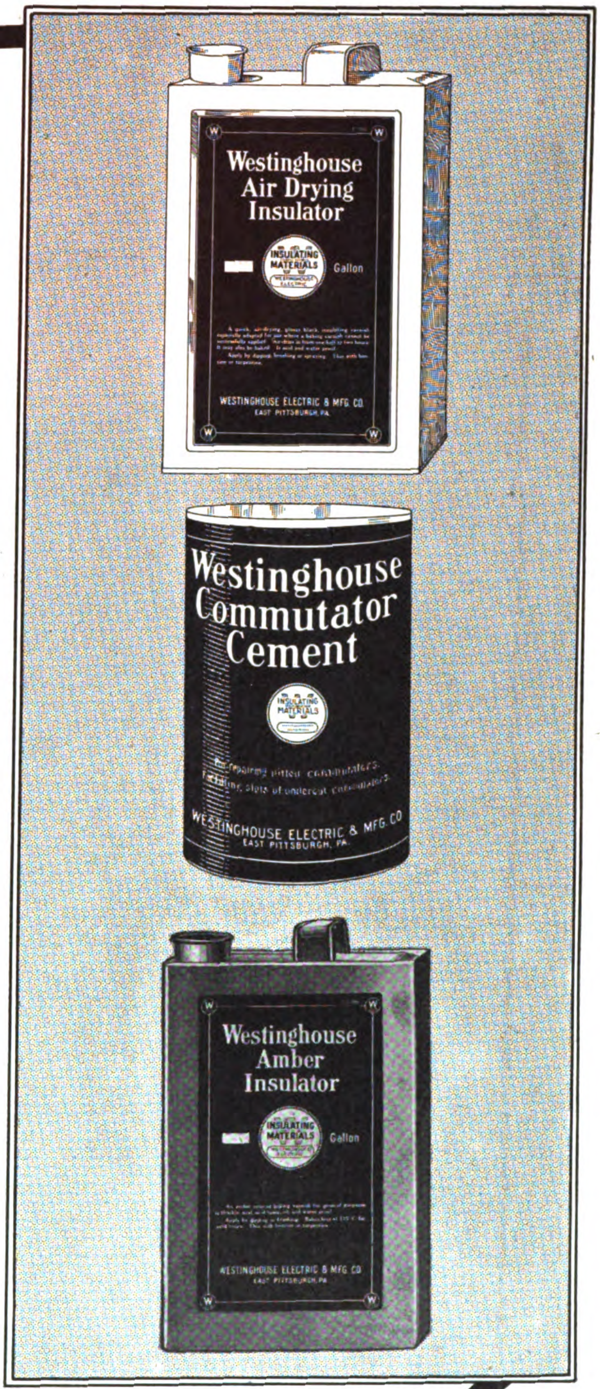
WESTINGHOUSE ELECTRIC

A supply of dependable insulating materials is indispensable to the railway shop, and it is of the greatest importance that the quality be of one grade -- the best.

Westinghouse research engineers have spent more than 30 years in the development of insulating materials, with constant thought of the part they play in the successful operation of electrical equipment.

The products of their study have satisfactorily met the requirements of Westinghouse products, just as they will meet the requirements of any apparatus in which the best insulation is essential.

Insulating materials, identical with those used successfully in Westinghouse products, are available to the industry in handy containers, ready for instant use. And, moreover, a Westinghouse engineer is immediately available to help in the solution of any insulating problem that may arise.

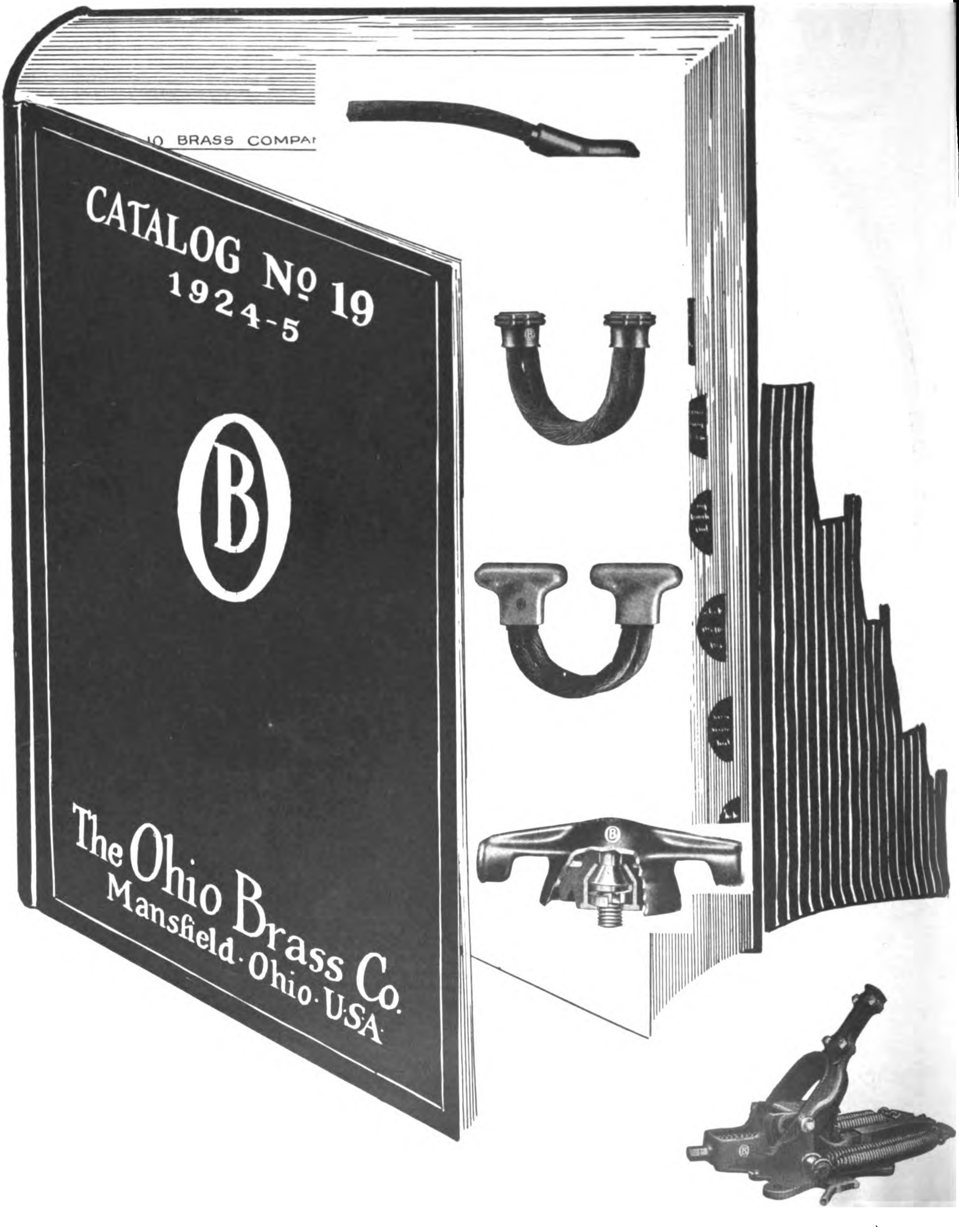

Westinghouse Air Drying Insulator
Insulating Materials
Gallon
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.
Westinghouse Commutator Cement
Insulating Materials
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.
Westinghouse Amber Insulator
Insulating Materials
Gallon
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Sales Offices in All Principal Cities of the
United States and Foreign Countries

Westinghouse

LOW MAINTENANCE


O BRASS COMPA
CATALOG No 19
1924-5
OB
The Ohio Brass Co.
Mansfield·Ohio·U.S.A.

With Ⓑ Equipment *Means Lower Maintenance for the* SYSTEM!

SATISFACTORY all-around performance of O-B Products naturally means low maintenance costs. A large list of users will testify to that. And because O-B Products require low maintenance they reflect their savings in the operation of the whole system.

Use the new No. 19 Catalog as a handy reference. Make sure you have your copy.

LINE MATERIALS

Trolley Hangers
Trolley Ears and Splicers
Trolley Frogs and Cross-overs
Strain and Pin Insulators
Trolley Guard
Pole Line Hardware
Catenary Materials

RAIL BONDS

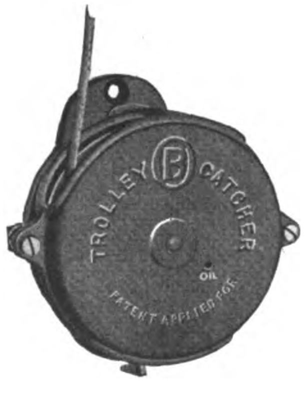
Electric Arc Weld
Gas Weld
Pin and Compressed Terminal
Electric Arc Welding Apparatus
Bonding Tools and Accessories

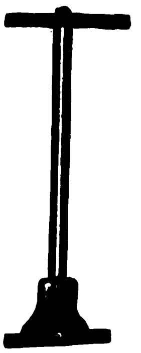
CAR EQUIPMENT

Trolley Bases
Trolley Catchers and Retrievers
Tomlinson Automatic Couplers
Electric Couplers
Crouse-Hinds Imperial Headlights
Air Sander Equipment
Emergency Hose Bridges

INSULATORS

High Tension Porcelain
Pole Line



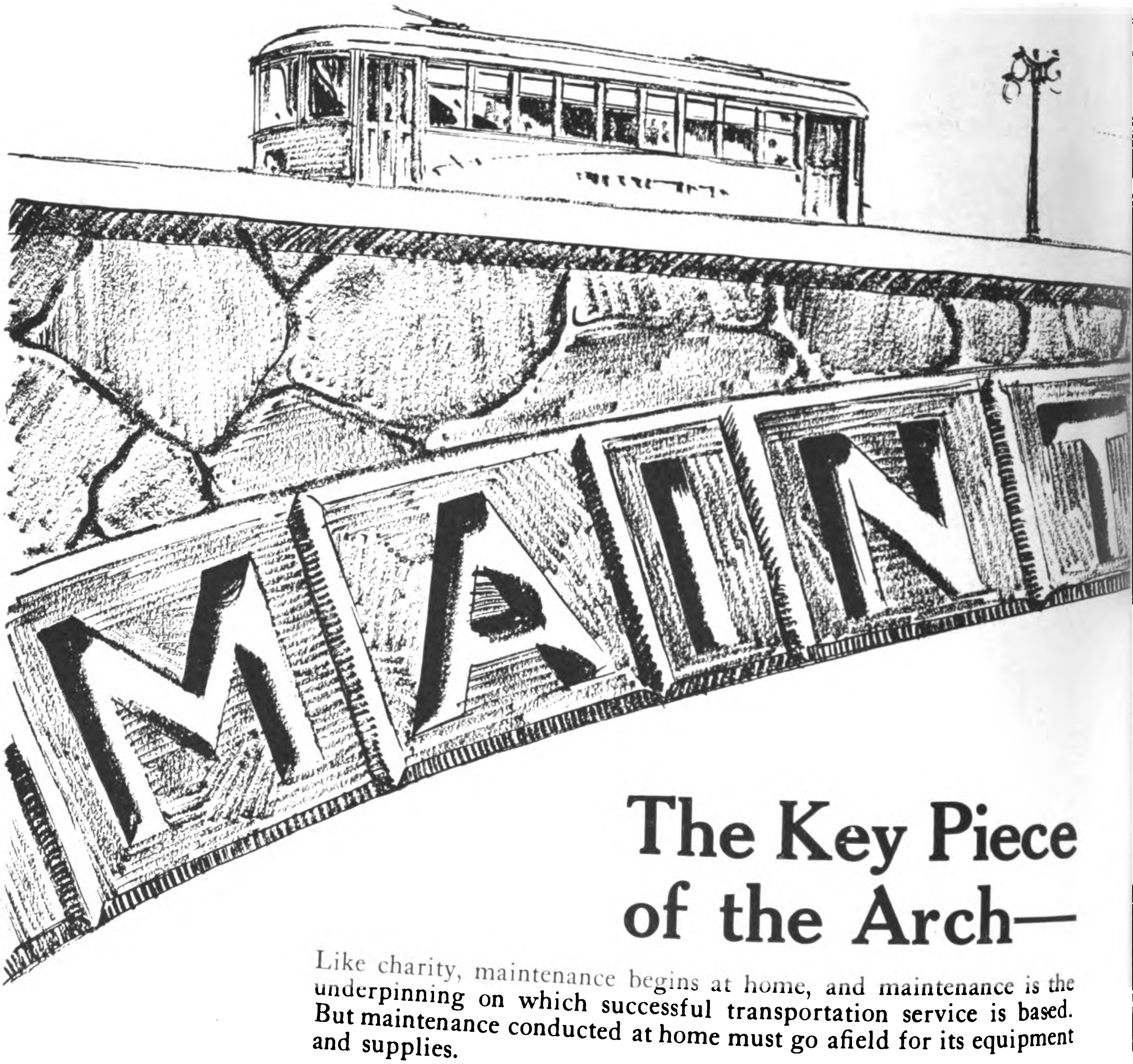


O-B Marathon Ear

THE OHIO BRASS CO.
Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE



The Key Piece of the Arch—

Like charity, maintenance begins at home, and maintenance is the underpinning on which successful transportation service is based. But maintenance conducted at home must go afield for its equipment and supplies.

For many years railway companies have been depending upon Keystone Car Equipment, Track Equipment and Line Equipment for the successful and economical execution of maintenance programs. Keystone Equipment is truly the key piece of the supporting arch of railway maintenance.

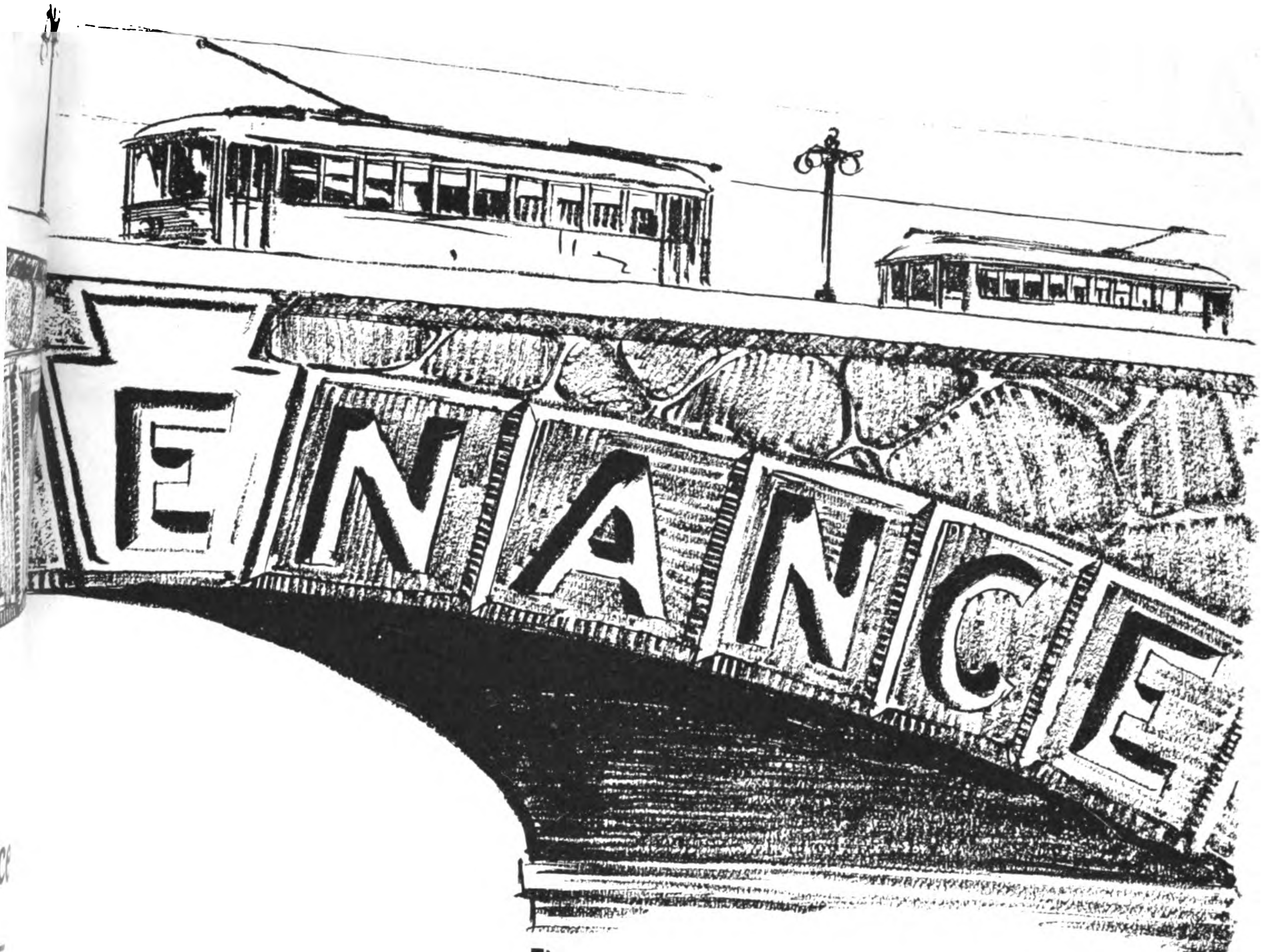
The partial lists below indicate the wide range and serviceability of Keystone Equipment.

Keystone Car Equipment

Illuminated Destination Signs
Steel Gear Cases
Motormen's Seats
Faraday Car Signals
Lighting Fixtures
Golden Glow Headlights
Headlight Resistances
Air Sanders
Trolley Catchers
Shelby Trolley Poles
Lightning Arresters
Rotary Gongs
International Fare Registers
Fare Register Fittings
Samson Cordage
Air Valves
Cord Connectors
Trailer Connectors
Automatic Door Signals
Standard Trolley Harps
Standard Trolley Wheels

Keystone Line and Track Equipment

Rail Bonds
Rail Bond Testers
Electric Drills
Section Switches
Section Insulators
Trolley Hangers
Lightning Arresters
Trolley Ears
Trolley Frogs
Splicing Sleeves

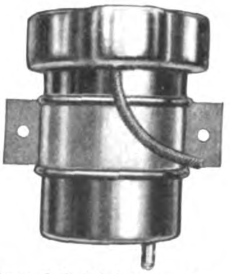


Type RR-96
Golden Glow
Headlight

Typical Hunter
Route Number
Sign

Typical Keystone-Hunter
Destination Sign

Keystone Gear Case


Type I.C. Light Arrester

FARADAY
SIGNAL SYSTEM
NO 22181-600 VOLTS
ELECTRIC SERVICE SUPPLIES CO
Faraday Signal System
Resistance Box

ELECTRIC SERVICE SUPPLIES CO

ELECTRIC SERVICE SUPPLIES CO.

PHILADELPHIA
17th and Cambria Sts.
PITTSBURGH
829 Oliver Building

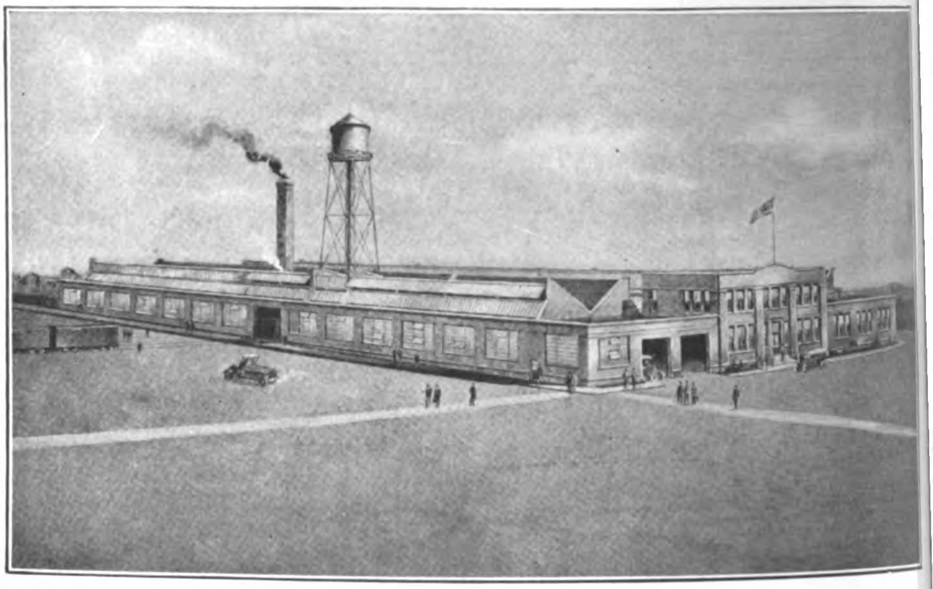
NEW YORK
50 Church St.
SCRANTON
316 N. Washington Ave.

CHICAGO
Monadnock Bldg.
BOSTON
88 Broad St.

Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver

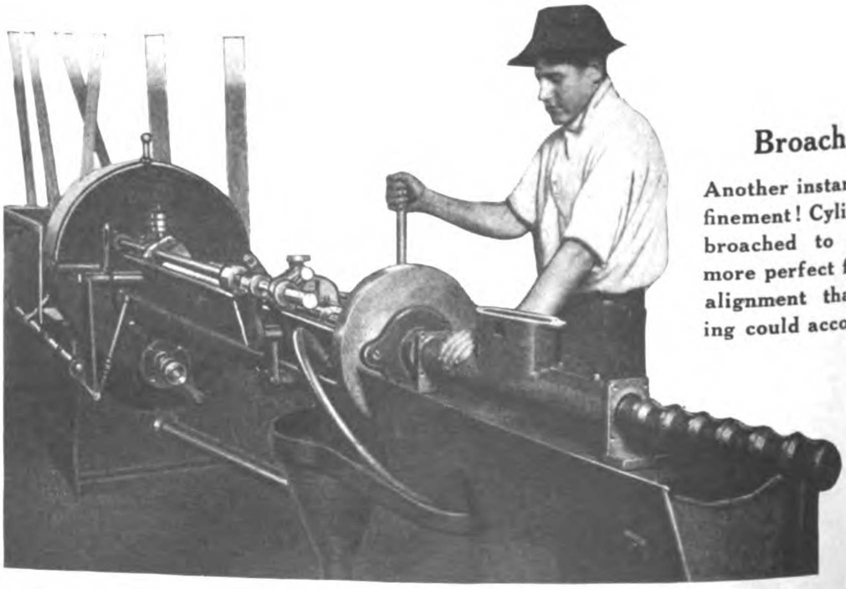
Manu

Manufactured in an up-to-date plant under the very best methods of production.



The Home of

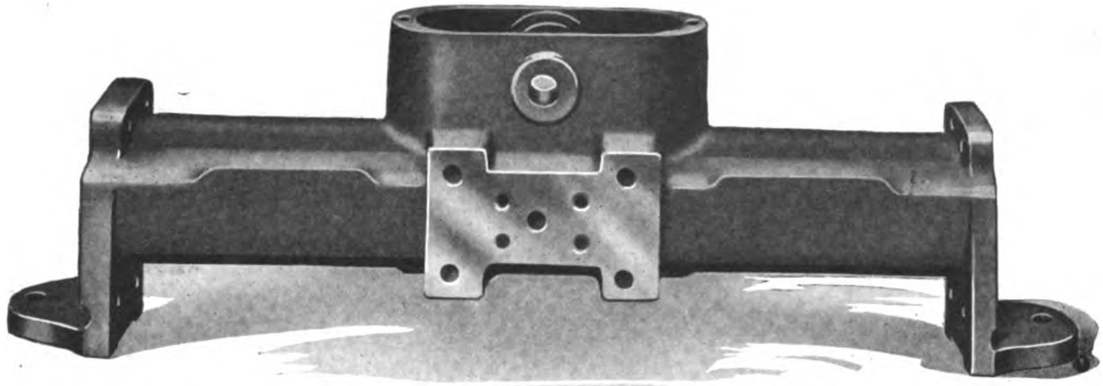
NATIONAL PNEUMATIC DOOR ENGINES

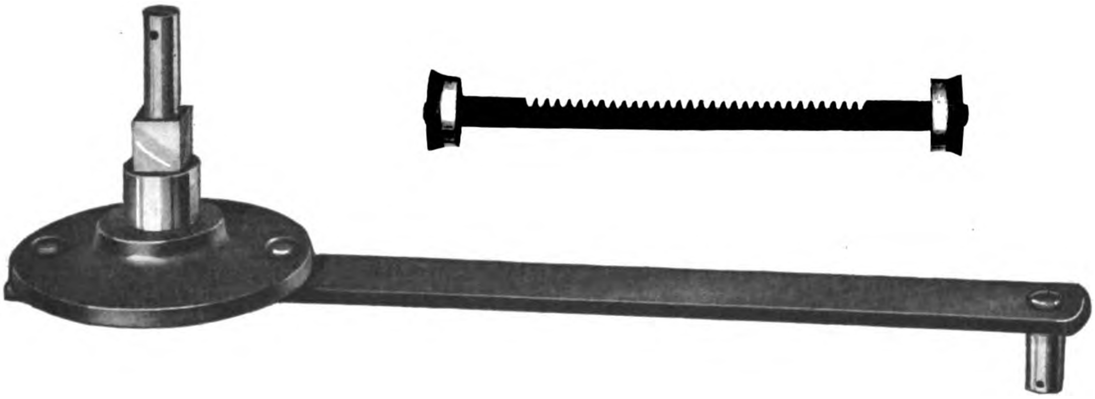


Broaching

Another instance of refinement! Cylinders are broached to secure a more perfect finish and alignment than grinding could accomplish.

facture





Why maintenance need not worry

All parts *extra strong* and *rigid.*
Large bearing surfaces.
Rack and gear enclosed to keep out dirt and retain lubricants.
Valves of *hard drawn manganese bronze.*
No packing glands to be maintained.
Non-adjustable *reserve cushion.*
Automatic lubrication.

National Pneumatic Co., Inc.

50 Church Street, New York
Colonial Trust Bldg., Philadelphia
McCormick Bldg., Chicago
Works: Rahway, N. J.

Manufactured in Canada by Dominion Wheel & Foundries, Ltd., Toronto, Ont.

$25,000 a year for abrasives

That's what one road buys of us. Every so often we hear that they have made another comparative test between our stock grinding wheels and test samples supplied by somebody else who wants the business.

We don't hear of the tests until they're all over. But we keep on supplying grinding wheels and bricks for the track grinders. Looks to us as though this tended to show that we supply good abrasives.

Do we supply yours? May we have an opportunity to discuss it?

Railway Track-work Co.

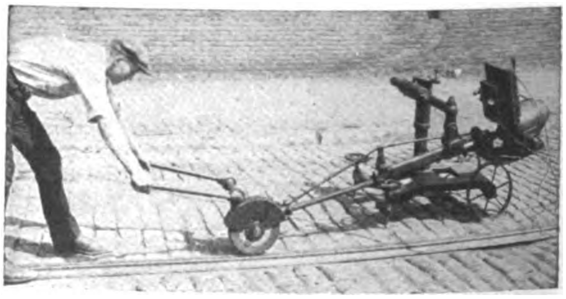
3132-48 East Thompson Street, Philadelphia

AGENTS:

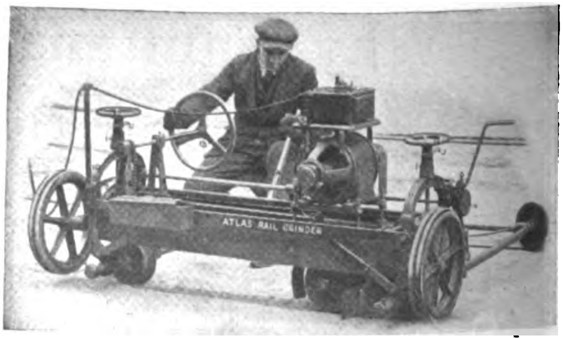
Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London

"Reciprocating" Track Grinder

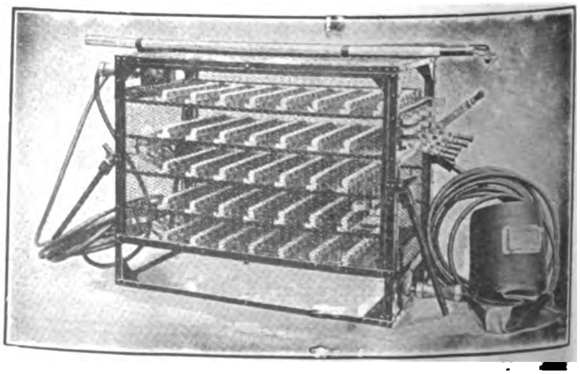
"Universal" Rotary Track Grinder



"Hercules" Rail Grinder



"Atlas" Rail Grinder



"Ajax" Electric Arc Welder

INTERBOROUGH RAPID TRANSIT CO.

Multiple Unit Door Control

OKONITE Wire Used Exclusively

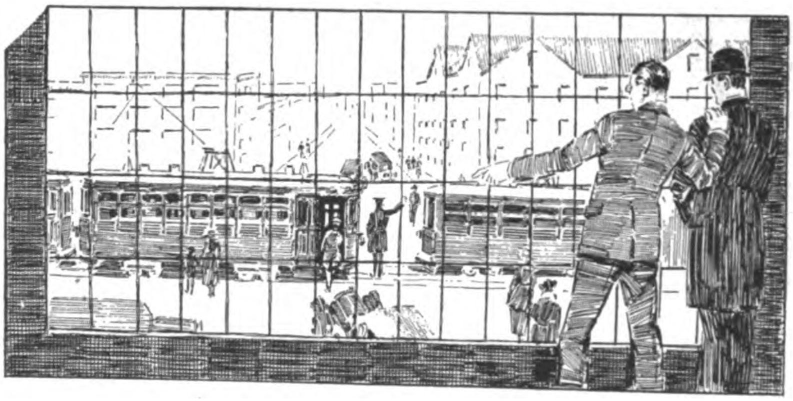
Every precaution has been taken to insure the safety of the passengers and the reliability of operation.

Door detail showing signal light and safety buffer

Ten Car Train Equipped with Multiple unit door Control

THE OKONITE COMPANY, PASSAIC, N. J.
INCORPORATED 1884
Sales Offices: New York · Atlanta · Pittsburgh · San Francisco
General Western Agents: Central Electric Company, *Chicago, Ill.*
F. D. Lawrence Electric Co., Cincinnati, O. Novelty Electric Co., Philadelphia, Pa.
Pettingell-Andrews Co., Boston, Mass.
Canadian Representatives: Engineering Materials Limited, Montreal

OKONITE



DEFINITION OF A SAFETY CAR

"Any type of car equipped with *adequate* safety devices for one-man operation."

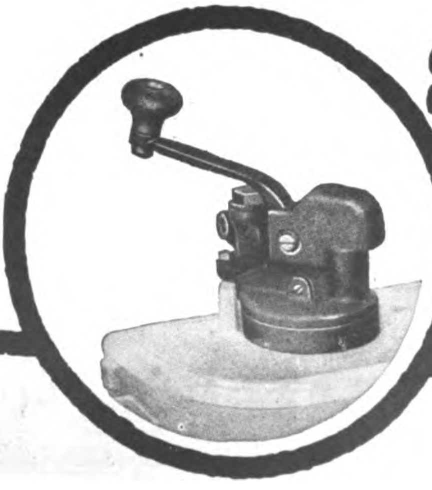
—*A.E.R.A. Committee on Safety Car Operation, 1921*

Safety Cars Have Succeeded When All Other Methods Failed

SAFETY CARS have an enviable record for reducing operating expenses and building revenue—pointing the way to success and prosperity—when all other methods failed.

The modern Safety Car has the carrying capacity and earning power of the average standard "two-man car," but requires only one man for safe, efficient operation. The saving in operating expense is profit.

We furnish the Air Brake and Safety Car Control Equipment which makes *any* car a Safety Car. (See the Safety Car definition above.)

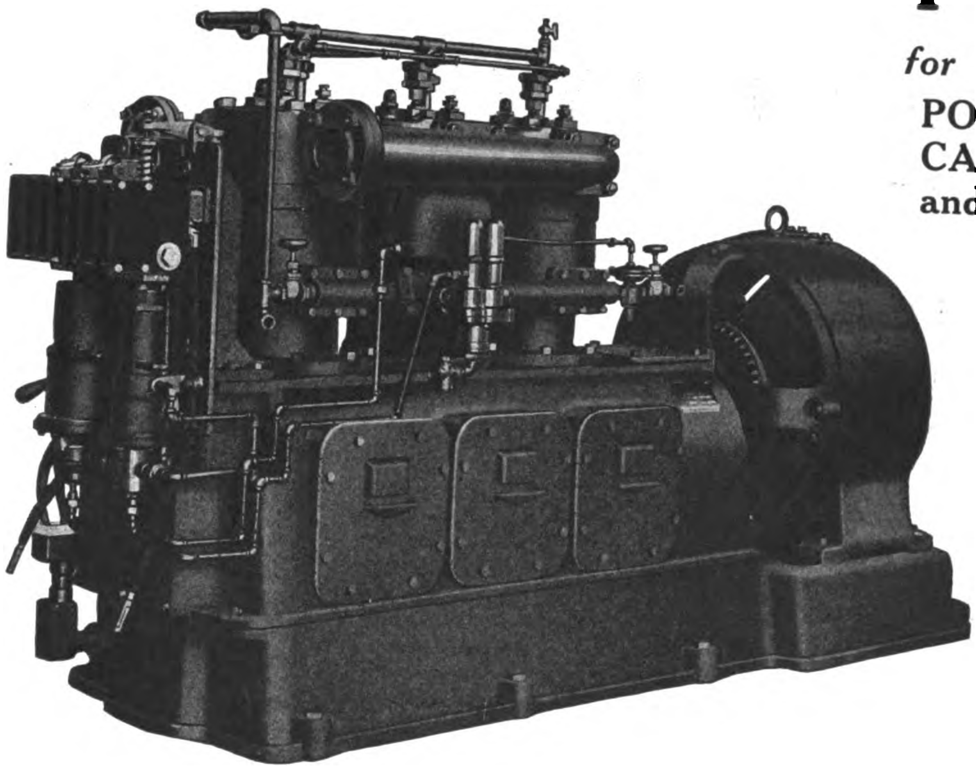


SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

Low-Maintenance Air Compressors

for

POWER HOUSES
CAR BARNS
and SHOPS



Famous Westinghouse-National Types

WESTINGHOUSE - NATIONAL AIR COMPRESSORS are noted for their fine construction, their smooth, steady, economical service, their reputation for practically never wearing out, and their low maintenance requirements.

Many of these Compressors built 15 and 18 years ago are still giving first-class service.

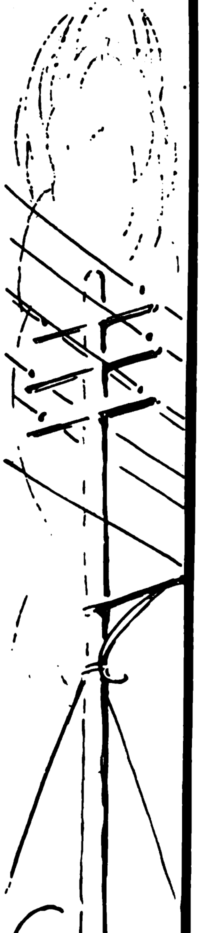
Users of Westinghouse-National Compressors not only enjoy long service and low upkeep, but they also realize a saving in operating power through the HP Automatic Control, which stops the machine when sufficient pressure has been built up, and causes the Compressor to remain at rest until a new air supply is needed, when operation is resumed. No power is wasted.

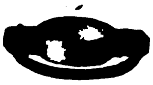
Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

"QUALITY MACHINES FOR QUALITY SERVICE"

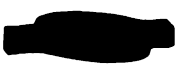
HUBBARD

LINE HARDWARE for the ELECTRIC RAILWAY

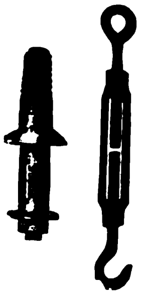




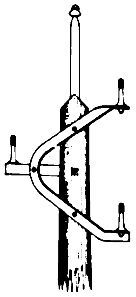
Pole Bands with Pull-off Rods



Split Pole Bands



Peirce Pins
Hubbard Turnbuckles



Bo-Arrow Arms

You'll find both convenience and economy—

in the plan of buying all your line hardware from Hubbard stocks.

The fact is that Hubbard can meet your needs, special or standard, more promptly, through 124 electrical jobbers, covering the country from coast to coast.

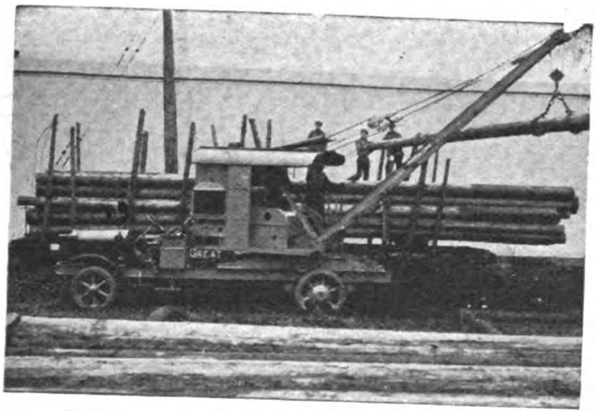
And in specifying Hubbard Line Hardware, you not only make sure of prompt service, but also of equipment manufactured from new rolled open hearth steel, of 55,000 to 65,000 lbs. tensile strength, and galvanized by the double-dip hot process.

Ask your nearest Hubbard jobber. We'll be glad to send his name and full details.

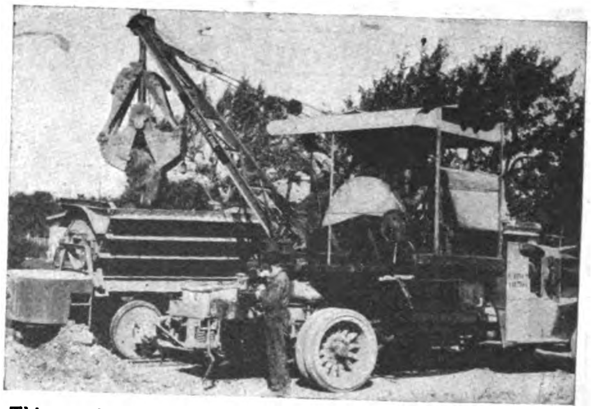
Peirce Forged Steel Pins
Peirce Insulated Pole Bands
Hubbard Trolley Pole Bands
Hubbard Turnbuckles
Hubbard Pole Bands with Pull-off Rods
Channel Arm Fixtures
Bo-Arrow Arms
Steel Cross Arms
Drop Forged Eyebolts
Etc., Etc.

Hubbard & Company
Chicago—Pittsburgh

The Hardware makes the line —
Hubbard makes the hardware —



Unloading cars of poles at a saving of $26 a car at 17% of former cost, equal savings on other operations.



This machine sets poles, lays track or handles 200 to 300 yards of material a day for the Cleveland Railway Company.

Equal to a Gang of 20 Men!

That's Lower Maintenance!

The Universal (mounted on a motor truck) is a whole gang in itself, no matter what the work is—handling trackwork, setting poles, loading excavated material, handling ballast and all heavy lifts up to 5 tons.

It moves from job to job with motor truck speed—and enables you to do the same work with *fewer men on every job.* Think of the Universal primarily as a maintenance—reducing machine. Nothing that street railway can buy will do more to keep down maintenance costs.

The Universal passed the experimental stage four years ago and is now recognized as the most stable and dependable machine in the mobile crane field. No out-riggers required. Full circle swing. One-man operation. Highest grade construction throughout.

Write for Bulletin R-22

THE UNIVERSAL CRANE CO.
1112 Swetland Bldg., Cleveland, Ohio
Branch Offices in principal cities

"Jack 'em out" SIMPLEX "Jack 'em out"

JACKS JACKS

With Simplex Jacks
Pole Straightening is a "One Man" Job

Is It On *Your* Lines?

Pole Straightening is a One Man Job with a Simplex Pole Pulling and Pole Straightening Jack

With the multiplied man power in Simplex Jacks one man can straighten the largest pole in less than two minutes.

The jack pivots on its base and follows its load. The I-Beam Base bites into the soil and prevents slipping. The pronged cap of the rack bar is pressed against the pole and holds it securely while the man steps away to sight the pole.

The jack is so powerful it forces the earth back and all it is necessary to do is tamp the loose dirt on the "jack side" of the pole.

The double lever socket enables the man to get a powerful leverage at any working angle of the jack.

Distributed by

Western Electric Company

Offices in 47 Cities

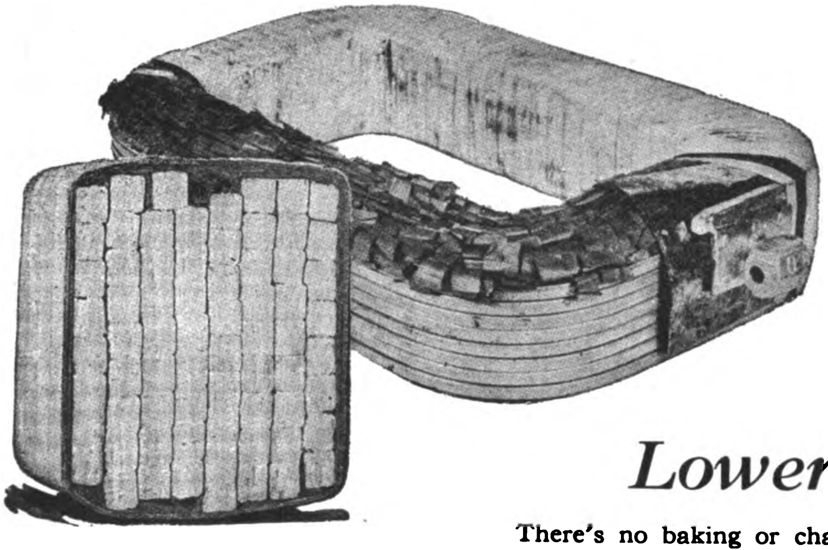
Manufactured by

Templeton, Kenly & Co., Limited

Established 1899
Sole Manufacturers
Chicago Ill. U.S.A.

Longer Life
Less Weight—High Salvage Value

Interior Insulation of these Coils is Permanent up to the Fusing Temperature of Aluminum



Lower Coil Cost

There's no baking or charring of insulation in the aluminum coil. The insulation is permanent, an integral part of the coil.

Aluminum is a good conductor of heat and the distribution of heat in the coil, is uniform. An aluminum coil is not broken down by either moisture or heat. It will withstand extreme overloading.

Even in addition to a substantial saving in weight (as much as 2000 pounds on some cars) an aluminum coil possesses marked advantages over other coils.

Since they were first introduced into America (three years ago) after fifteen years' service in Europe, these advantages have become more and more apparent.

More than 75 railways are now using them and many have placed repeat orders. The performance of the coil has justified its purchase.

The aluminum field coil has demonstrated its value in the transportation field. And now our replacement proposition gives to the user of aluminum coils an *exceptionally* low ultimate cost and no higher first cost.

Replacement Proposition

The high salvage value of a mechanically damaged Aluminum Field Coil, makes possible a replacement proposition whereby this company will furnish a new duplicate coil, F.O.B. Chicago, for 60 per cent of the then sale price of the new coil plus the return of any damaged coil.

Economy Electric Devices Co.
L. E. Gould, Pres., Old Colony Bldg., Chicago
Cable Address: Sangamo, Chicago

ALUMINUM COILS

Inspectio
On Basis o

Economy Power-Savin
and Most Efficient Basi

7023
KILOWATT HOURS
C
B
A
ECONOMY ELECTRIC RAILWAY METER
SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS
NO 1036948 VOLTS 550 AMPS 100
3 3 1/3 WATTHOURS PER DISK REVOLUTION
MFD. EXCLUSIVELY FOR
ECONOMY ELECTRIC DEVICES CO.
CHICAGO

"I would have these meters if only for their value from a maintenance standpoint."

That was the opinion of the Superintendent of Equipment on a large eastern property. Every car on the system was equipped with an Economy Meter, with car inspection dials, and this opinion was based on actual experience in the shops and car houses. Note the two principle forms used for car inspection on the opposite page.

KILOWATT-HOUR consumption between inspections is the safest, most efficient and most readily available measure of work done by the essential parts that wear and need inspecting.

1. All electrical equipment depreciates and wears in direct proportion to the energy consumed by the car motors.
2. The wear of truck parts, brakeshoes and wheels depends upon speed, stops per mile, condition of track, weight, etc., which are the factors determining energy consumption.
3. If a motor is working unsatisfactorily for any reason, such as faulty connection, open armature coils, short fields, etc., more energy will be consumed and the car should therefore be brought in sooner for inspection.
4. If a car is on an easy-schedule line, having infrequent stops and low grades, it will consume less energy than a car operating on a difficult schedule with frequent stops and severe grades. On a mileage or time basis, each car would receive an equal number of inspections. On a kilowatt-hour basis less inspection would be given the car operating on the easy schedule and thus a substantial saving in labor would be effected.
5. If an equipment is unsuited for its service it will consume more energy and should come in more promptly for inspection.
6. If a car has tight brakes or nosing trucks, it will consume more energy and come in more promptly for inspection.
7. If a car is handled roughly or improperly by motormen it will consume more energy and, therefore,

ECONOMY METER

# of Equipment Work Done

Meters Provide the Safest or Equipment Inspection

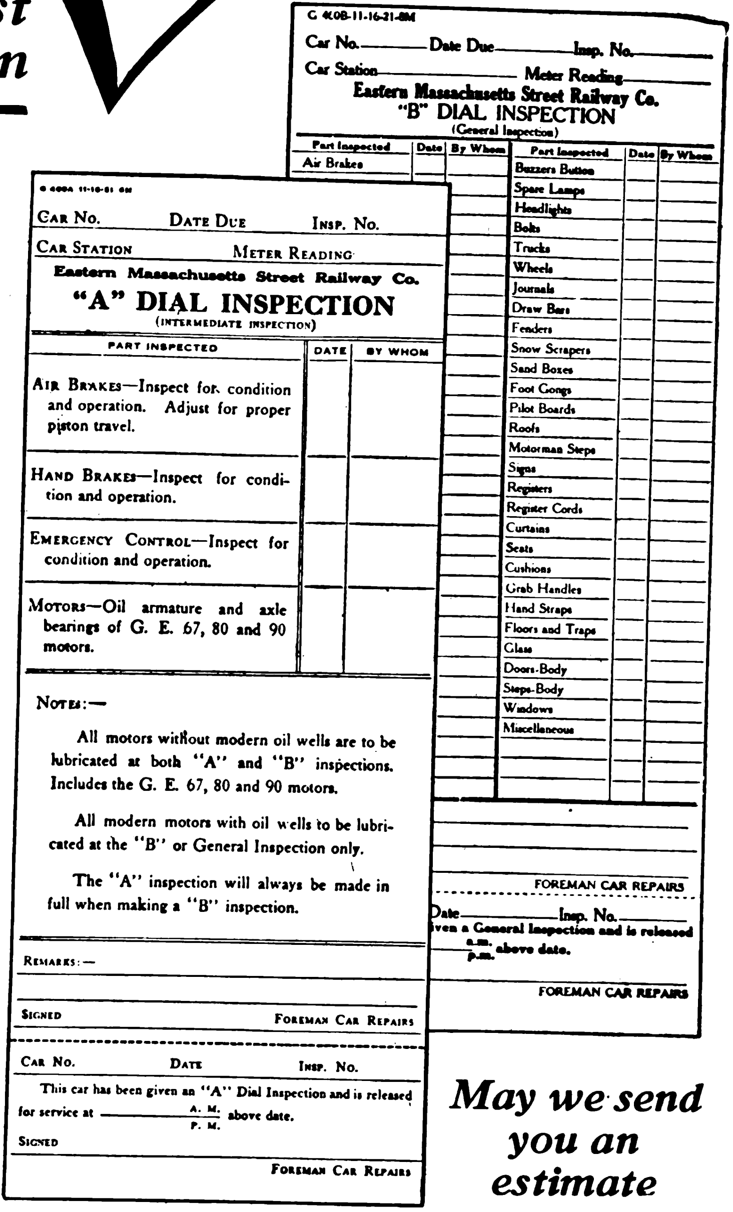
will need inspection more frequently than one which is properly handled. Inspection on a kilowatt-hour basis automatically shortens the inspection period on the roughly handled car and prolongs the period on the properly handled car.

8. Work done by a car operated by barn forces or when hauling a trailer is not accounted for on the time or mileage basis. The kilowatt-hour basis measures every bit of work done by a car no matter who operates it.

By providing a method that accurately and automatically shows when inspection is needed, the kilowatt-hour basis also shows at a glance how much more work a car can do before inspection is needed or, in case of a road failure, how much work it has done previous to the failure.

The result is that more thorough inspection is obtained without increased labor cost or the previous standard of inspection is maintained for less carhouse labor cost.

The Economy Railway Meter in addition to paying for itself in a few months in power saved also provides the means for placing inspection on the energy consumption basis, the most accurate and efficient measure.



G 4OB-11-16-21-8M

Car No.________ Date Due__________ Insp. No.__________

Car Station__________________ Meter Reading__________

Eastern Massachusetts Street Railway Co.

"B" DIAL INSPECTION

(General Inspection)

Part Inspected	Date	By Whom
Air Brakes		

Part Inspected	Date	By Whom
Buzzers Button		
Spare Lamps		
Headlights		
Bolts		
Trucks		
Wheels		
Journals		
Draw Bars		
Fenders		
Snow Scrapers		
Sand Boxes		
Foot Gongs		
Pilot Boards		
Roofs		
Motorman Steps		
Signs		
Registers		
Register Cords		
Curtains		
Seats		
Cushions		
Grab Handles		
Hand Straps		
Floors and Traps		
Glass		
Doors-Body		
Steps-Body		
Windows		
Miscellaneous		

FOREMAN CAR REPAIRS

Date__________ Insp. No.__________

iven a General Inspection and is released

________ a.m./p.m. above date.

FOREMAN CAR REPAIRS

G 400A 11-10-21 6M

CAR NO. DATE DUE INSP. NO.

CAR STATION METER READING

Eastern Massachusetts Street Railway Co.

"A" DIAL INSPECTION

(INTERMEDIATE INSPECTION)

PART INSPECTED	DATE	BY WHOM
AIR BRAKES—Inspect for condition and operation. Adjust for proper piston travel.		
HAND BRAKES—Inspect for condition and operation.		
EMERGENCY CONTROL—Inspect for condition and operation.		
MOTORS—Oil armature and axle bearings of G. E. 67, 80 and 90 motors.		

NOTES:—

All motors without modern oil wells are to be lubricated at both "A" and "B" inspections. Includes the G. E. 67, 80 and 90 motors.

All modern motors with oil wells to be lubricated at the "B" or General Inspection only.

The "A" inspection will always be made in full when making a "B" inspection.

REMARKS:—

SIGNED FOREMAN CAR REPAIRS

CAR NO. DATE INSP. NO.

This car has been given an "A" Dial Inspection and is released for service at ________ A. M./P. M. above date.

SIGNED

FOREMAN CAR REPAIRS

May we send you an estimate

Economy Electric Devices Co.

L. E. Gould, Pres., Old Colony Bldg., Chicago

Cable Address: Sangamo, Chicago

Standard on nearly 200 roads

Saving 1/3 to 1/2 cent per car mile

"Send Us Some More of The Big Texas Ties"

—said the Roadmaster

WHEN he said BIG TEXAS TIES he meant *International* Ties. He said BIG—because the *International* Ties were bigger, and contained more timber than the general run of ties he was receiving. This roadmaster was a good judge of value too.

He wanted MORE—because he knew the perfect uniformity and the mechanical soundness of *International* Ties would give longer and more dependable service than heretofore received from "just ties."

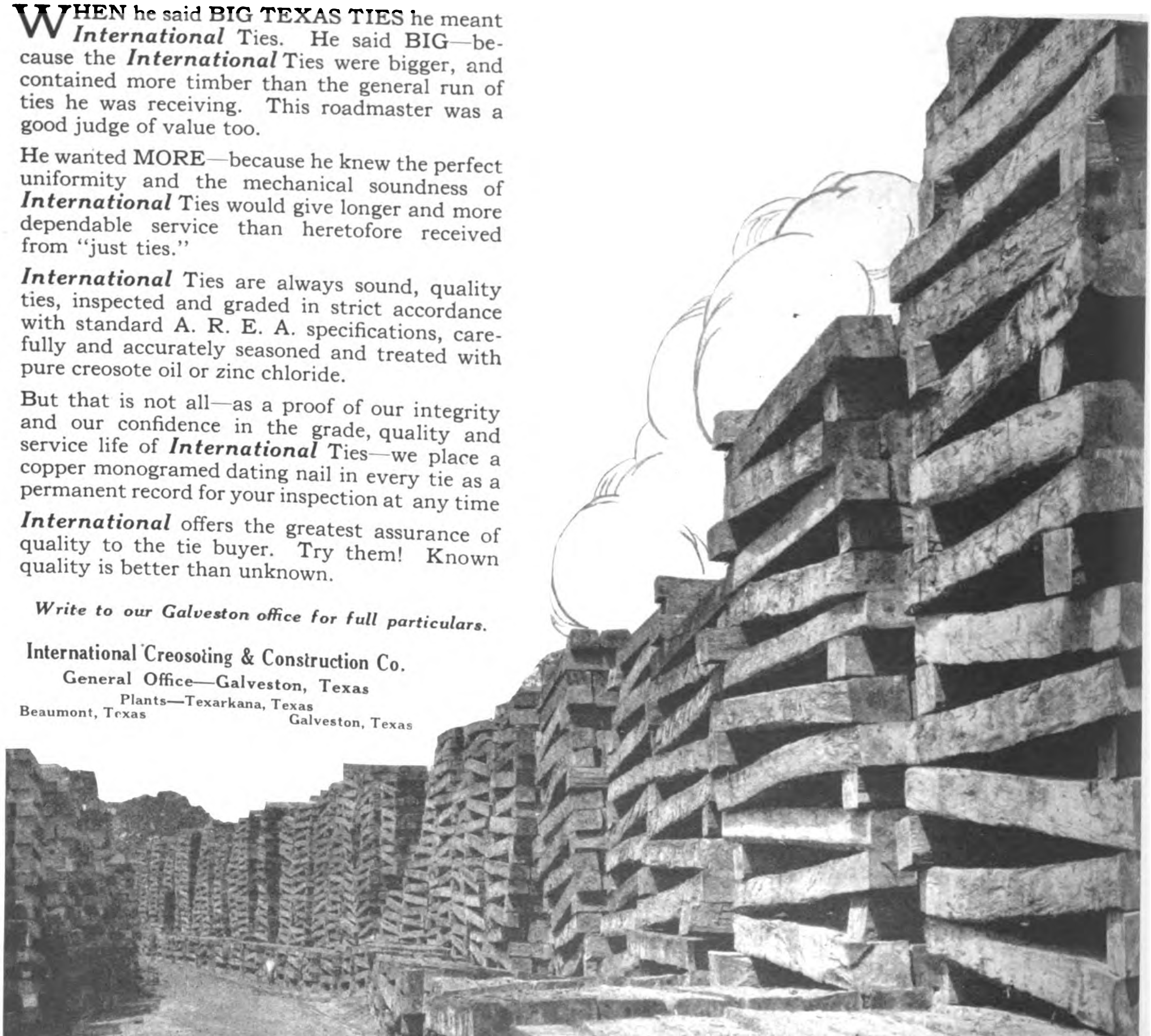
International Ties are always sound, quality ties, inspected and graded in strict accordance with standard A. R. E. A. specifications, carefully and accurately seasoned and treated with pure creosote oil or zinc chloride.

But that is not all—as a proof of our integrity and our confidence in the grade, quality and service life of *International* Ties—we place a copper monogramed dating nail in every tie as a permanent record for your inspection at any time

International offers the greatest assurance of quality to the tie buyer. Try them! Known quality is better than unknown.

Write to our Galveston office for full particulars.

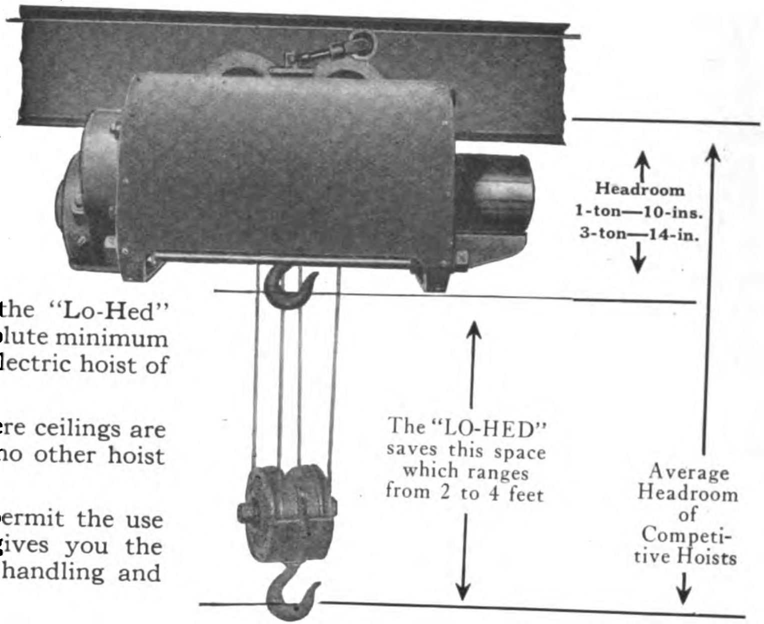
International Creosoting & Construction Co.
General Office—Galveston, Texas
Plants—Texarkana, Texas
Beaumont, Texas Galveston, Texas



LO-HED PATENTED

"The Electric Hoist that Operates in the Minimum Headroom"—

The Ideal hoist for railroad repair shop service—


Headroom
1-ton—10-ins.
3-ton—14-in.
The "LO-HED" saves this space which ranges from 2 to 4 feet
Average Headroom of Competitive Hoists

Because of exclusive features of design, the "Lo-Hed" mono-rail electric hoist operates in the absolute minimum headroom—2 to 4 ft. less than any other electric hoist of equal capacity.

The "Lo-Hed," therefore, can be used where ceilings are low—in fact where they are so low that no other hoist of any type could be used.

Even where ceilings are high enough to permit the use of other electric hoists, the "Lo-Hed" gives you the advantages of 2 to 4 ft. mor space for handling and storing materials.

In addition to this minimum headroom feature, the "Lo-Hed" is a mechanically superior hoist. It is simple, rugged and easy to operate; saves material handling time and labor and speeds up production; has a surprisingly small number of working parts and all of them are readily accessible; has high mechanical efficiency and low wear; is absolutely safe.

The "Lo-Hed" is the standard hoist in many railroad repair shops. In the Altoona Shop of the Pennsylvania Railroad, for example, the "Lo-Hed" was selected for its space-saving, dependable operation and exceptionally fine mechanical construction. In this shop there are thirty-five "Lo-Heds" in use. A few of the many other railroad repair shops equipped with the "Lo-Hed" are:

Duluth, Missabe & Northern Railroad,
Duluth, Minn.

E. St. Louis & Sub. Rwy. Co.,
E. St. Louis, Ill.

Pullman Car Works,
Pullman, Ill.

Texas & Pacific Rwy. Co.,
Marshall, Texas.

Missouri Pacific R.R. Co.,
St. Louis, Mo.

St. Lo. & San Francisco Ry.,
Thomas, Ala.

The profusely illustrated "Lo-Hed" catalog describes in detail the many advantages of this unusual hoist. Every shop superintendent should have a copy. Send today for yours.

Capacities—1000 to 12,000 lbs.
Types for A.C. or D.C.

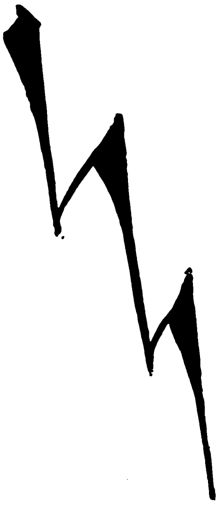
Without trolley—floor operated
Plain trolley—floor operated
Hand geared trolley—floor operated
Motor-driven trolley—floor operated
Motor-driven trolley—cab control.

Operates on standard I-beam track around curves and through switches

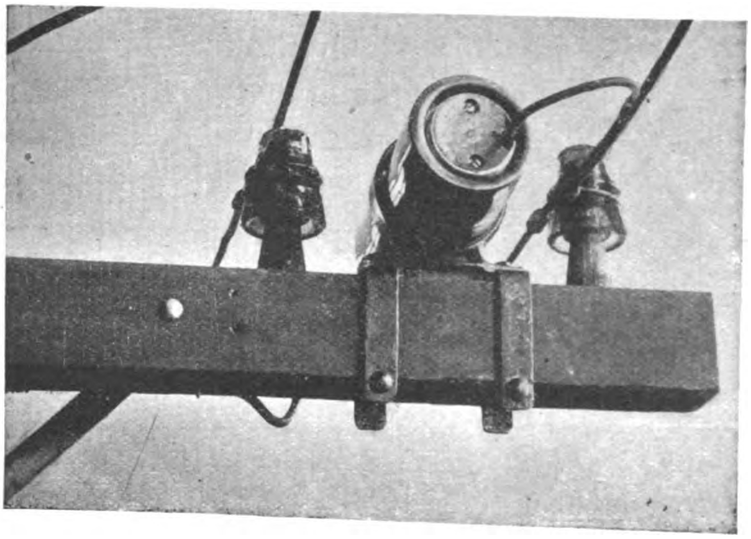
American Engineering Company

2417 Aramingo Avenue, Philadelphia, Pa.

Spring is here



Look out for Lightning

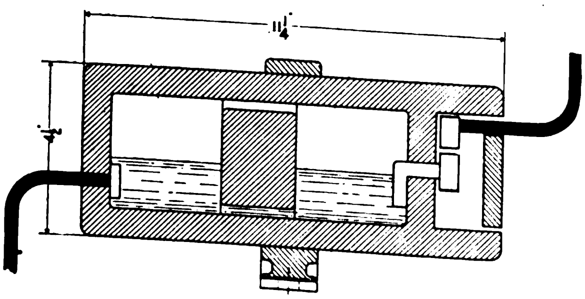


The Bennett Lightning Arrester

(F-23)

Suitable for service on circuits of moderate capacity.

—Either A.C. or D.C.
600 to 4000 volts



Write for this:

More than a catalog—a bulletin of engineering information—giving sizes, dimensions and all necessary data bearing on the subject of lightning-arrester protection.

Write for a copy now

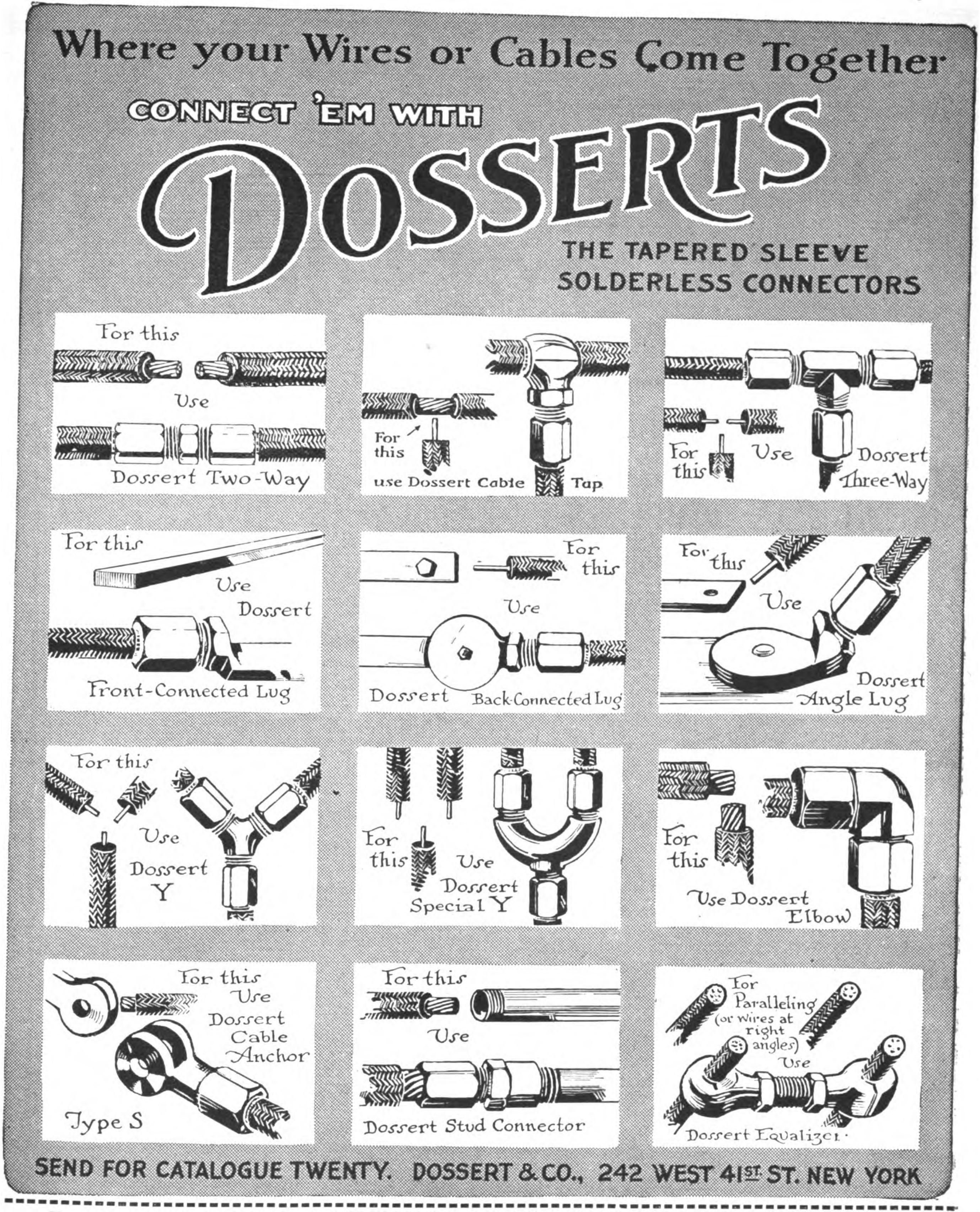
ELPECO

ELECTRIC POWER EQUIPMENT CORPORATION

412-20 No. 18th St. **PHILADELPHIA**

Manufacturers of High Tension Apparatus

NEW— **1** **A complete revised catalog— just off the press** **2** **A three color wall card as illustrated below.**


Where your Wires or Cables Come Together
CONNECT 'EM WITH
DOSSERTS
THE TAPERED SLEEVE
SOLDERLESS CONNECTORS
For this
Use
Dossert Two-Way
For this
use Dossert Cable Tap
For this
Use
Dossert Three-Way
For this
Use
Dossert
Front-Connected Lug
For this
Use
Dossert Back-Connected Lug
For this
Use
Dossert Angle Lug
For this
Use
Dossert
Y
For this
Use
Dossert
Special Y
For this
Use Dossert
Elbow
For this
Use
Dossert
Cable
Anchor
Type S
For this
Use
Dossert Stud Connector
For Paralleling (or wires at right angles)
Use
Dossert Equalizer
SEND FOR CATALOGUE TWENTY. DOSSERT & CO., 242 WEST 41ST ST. NEW YORK

To Dossert & Co.,
242 West 41st St., New York City.

Please send new colored wallhanger and new catalog to the address below.

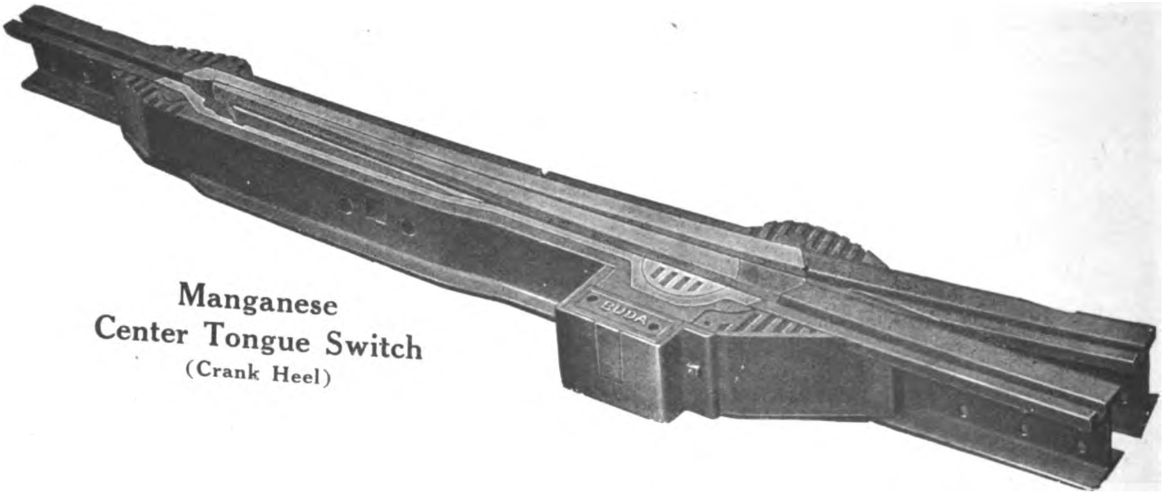
Name .... **Address** ....

Company ....

BUDA
ESTABLISHED
1881

ALL TYPES OF
SPECIAL TRACK WORK
(GIRDER AND T-RAIL)

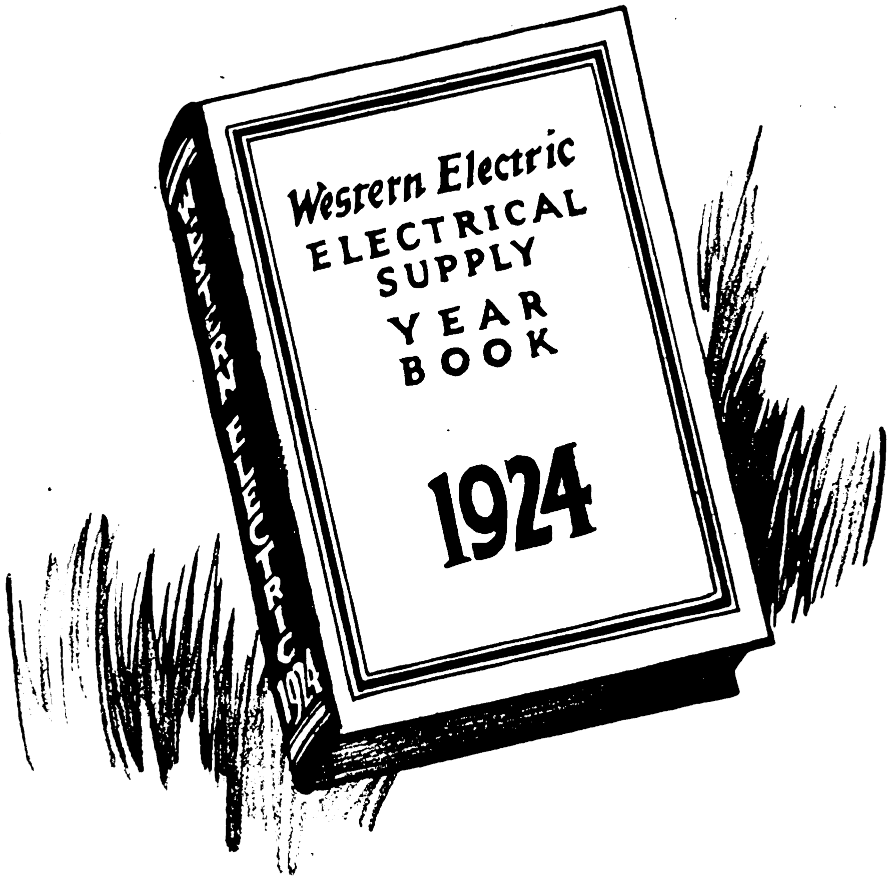
BUDA SUPPLIES ARE USED ON OVER
NINETY-EIGHT PER CENT OF THE
RAILROAD MILAGE OF THE
UNITED STATES



Manganese
Center Tongue Switch
(Crank Heel)

*Catalogs and Bulletins
on Request*

THE BUDA COMPANY
HARVEY (CHICAGO SUBURB) ILLINOIS



The book that puts your 5 foot shelf out of date

With the new Western Electric Year Book on your desk you have finger-tip information on over 60,000 electrical items—a veritable five-foot shelf of books, condensed and indexed for your convenience.

The completeness of Western Electric stocks means a real convenience in buying. Your order for everything electrical can be filled by our nearest House.

You will find that Distributing House mighty handy, too. It is one of 47 placed at important centers so we can speed up deliveries.

Write for your copy of the Year Book to our nearest House or 100 East 42nd Street, New York City.

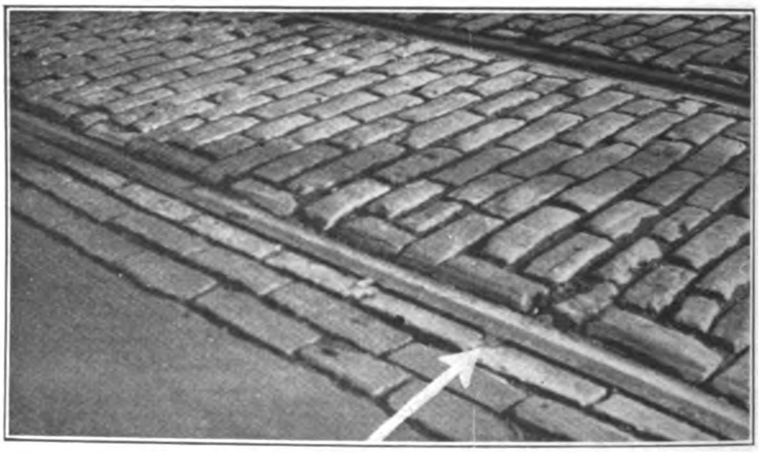
Western Electric Company

Offices in 47 Principal Cities

Don't be satisfied by cutting joint maintenance—

eliminate the joints

with



THERMIT INSERT RAIL WELDS

"The first cost is the last"

This slogan coined by one of the earliest users of Thermit Welds—has been echoed by scores of other users throughout all maintenance departments of the electric railway industry. Records on various roads covering ten years or more show remarkable results from the installation of Thermit Welds.

Here are some of the results:—no more cupped joints;—breakage so low that it cannot be calculated in percentages;—no rail bonding needed;—an end of paving troubles around the joints;—smoother riding track with less wear and tear on the car.

And the first cost is low enough to challenge comparison with any other type of joint.

Many railways are using Thermit Welding for—

Repairing broken switches, mates and loose arms in cast iron bound special work

Shop built special work

Repairing broken castings

One weld of this nature will often save enough to pay the entire cost of the

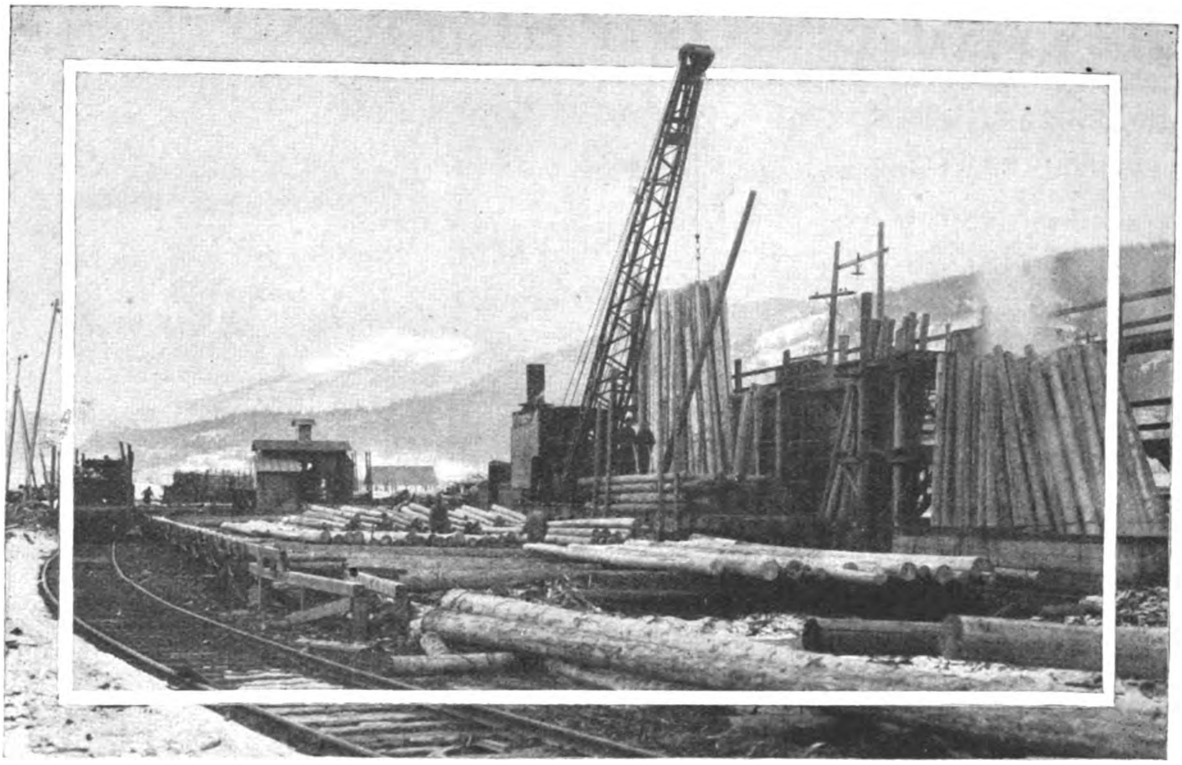
THERMIT WELDING OUTFIT

Write for our new and exhaustive Booklet "Thermit Rail Welding"

Metal & Thermit Corporation

120 Broadway, New York

PITTSBURGH CHICAGO BOSTON S. SAN FRANCISCO TORONTO



Western
Red Cedar

Light, Durable and Strong
Plain and Treated

Northern
White Cedar

Treating Plants!

NPCo

This brand on the butt of every pole identifies and guarantees it as National Pole Quality

Where tens of thousands of the finest poles that grow are annually received, sorted, inspected, treated and shipped to our great concentrating and distributing yards — there to be held, pending shipping instructions from the pole buyers of America.

The National Pole Company operate four of the largest and most efficient pole treating plants in the United States and maintain concentrating and shipping yards in many parts of America. This organization is always in a position to commence shipment on your order, the day your order is received.

NATIONAL POLE COMPANY

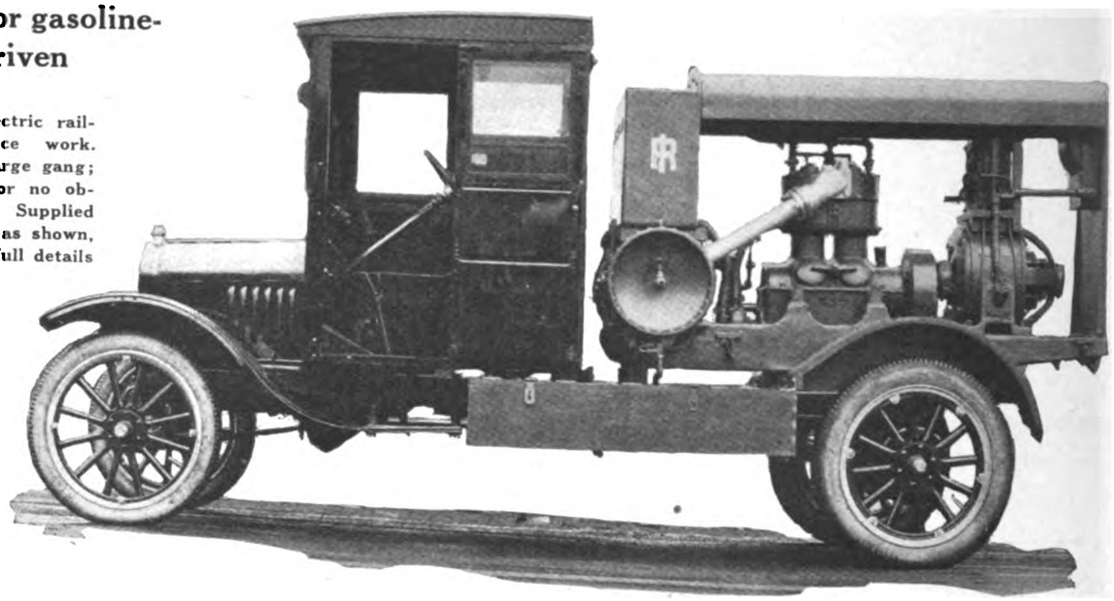
Escanaba, Michigan

Western Electric Company
Incorporated
Offices in 47 principal cities.

PORTABLE COMPRESSORS

Electric motor or gasoline-engine driven

The ideal outfit for electric railway track maintenance work. Ample capacity for a large gang; easily portable; little or no obstruction to traffic. Supplied mounted on Ford truck as shown, or on wheeled trailer. Full details on request.



Ingersoll-Rand

Tie Tampers
Paving Breakers
Riveting Hammers
Pneumatic Grinders
Pneumatic Wrenches
Pneumatic Rail Drills
Pneumatic Wood Borers
Portable Air Compressors

IR

**Small power—
a small gang
more work done
and a BIG SAVING**

with PNEUMATIC TRACK TOOLS

TIE TAMPERS **PAVING BREAKERS**

Five or six men using Ingersoll-Rand Tie Tampers and Paving Breakers can handle a job quicker and better than twice their number using hand tools.

Labor costs are practically halved! The sure "punch" of I.R. Pneumatic Tools tamp the track or breaks, or chips or rivets most efficiently. The equipment can be used in a dozen ways around the shops when not on the road.

Write us for full details before figuring on your 1924 track program.

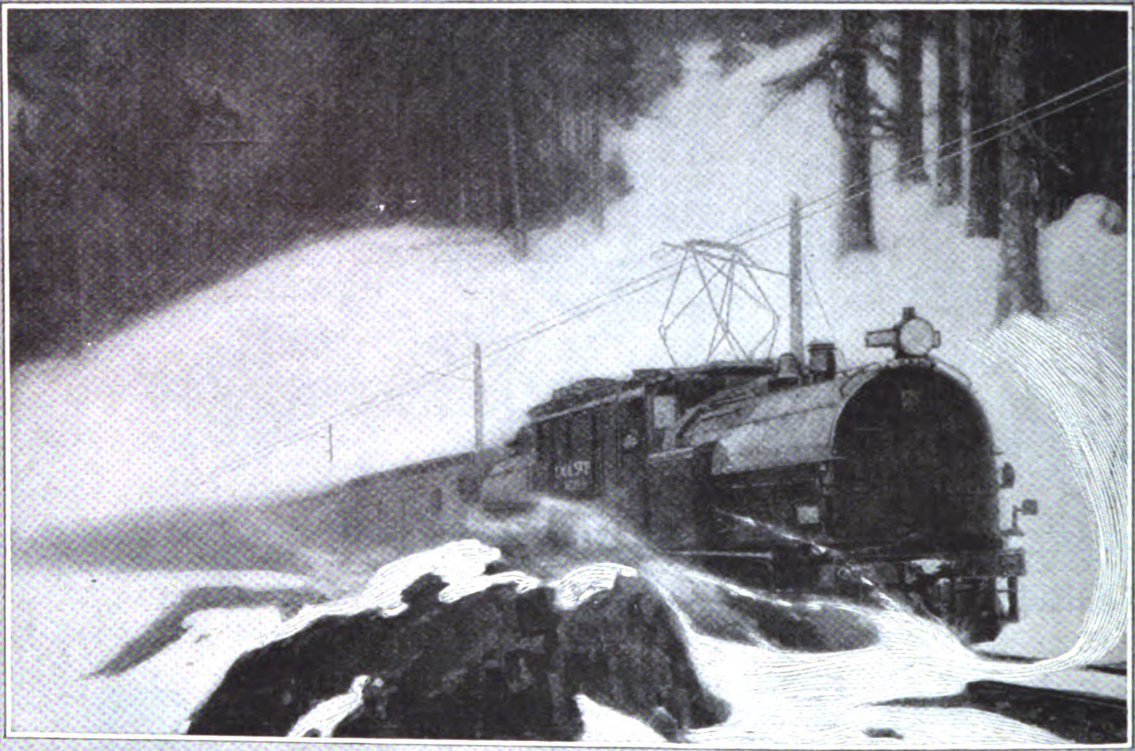
INGERSOLL-RAND COMPANY.
11 BROADWAY, NEW YORK

Atlanta
Birmingham
Boston
Buffalo
Butte
Chicago
Cleveland
Dallas
Detroit
Denver
Duluth
El Paso
Houghton
Joplin
Knoxville
Los Angeles
New York
New Orleans
Philadelphia
Pittsburgh
Pottsville
San Francisco
Salt Lake City
Scranton
Seattle
St. Louis
Washington

For Canada refer Canadian Ingersoll-Rand Co., Limited, 260 St. James St., Montreal

Tamping ties with I. R. Pneumatic Tie Tampers. The modern "sure-fire" low cost way.

Ingersoll-Rand



The Storm-test of Service

Five years of dependable service through varying temperatures, high winds, heavy snows, rain and thaws—such is the performance of 6,000,000 pounds of Anaconda Copper Trolley Wire, Feeder Cable and Signal Line Wire now in use on the Chicago, Milwaukee & St. Paul Rocky Mountain electrification.

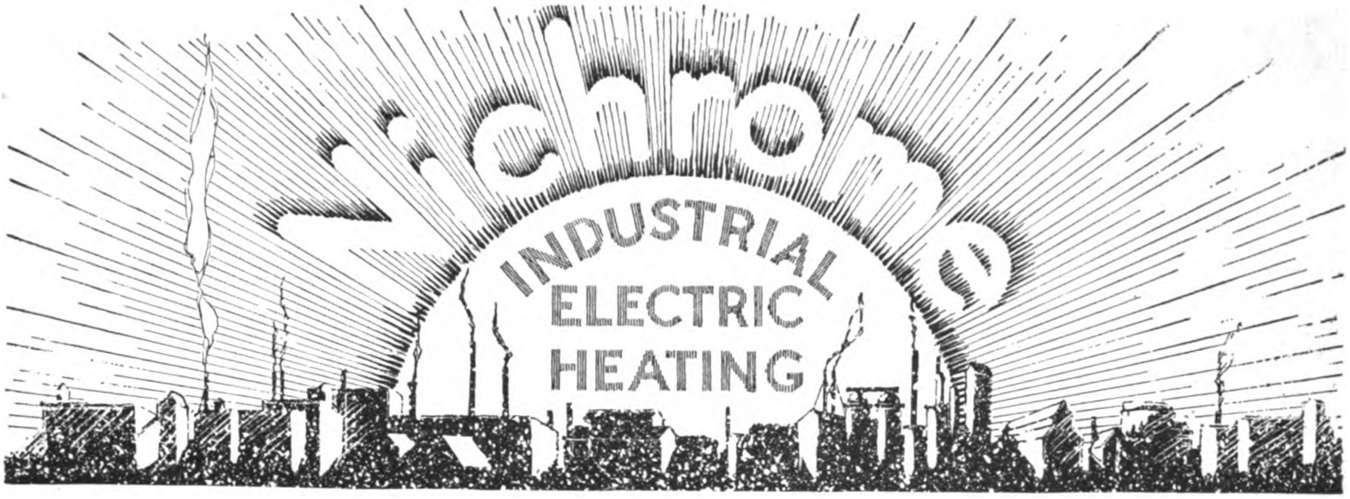
For uninterrupted service specify Anaconda Copper Wire.

Anaconda
Copper Mining
Company
Rolling Mills Dept.
Chicago, Ill.

ANACONDA
from mine to consumer
A Symbol of Quality Control

The
American Brass
Company
25 Broadway
New York

ANACONDA
TROLLEY WIRE



—only one thing more practical than

Electrically Heated Cars

— *namely:* Electric car heaters in which the heating element is practically permanent—almost immune from replacement and repairs.

The nearest approach to that ideal comes through the use of Nichrome. Proof: Nearly 20 years of performance.

And because of that superlative performance Nichrome is the standard of electric heating comparison.

That is why we say—if you want Nichrome performance and Nichrome dependability be sure that the real Nichrome is used in the heating units of your electric car heaters, as well as in electric furnaces, ovens and electrical heating equipment of all kinds.

We suggest this way of making sure: Specify in your orders *** *Heating units of Nichrome, the Driver-Harris resistor.* By including Driver-Harris you make doubly sure.

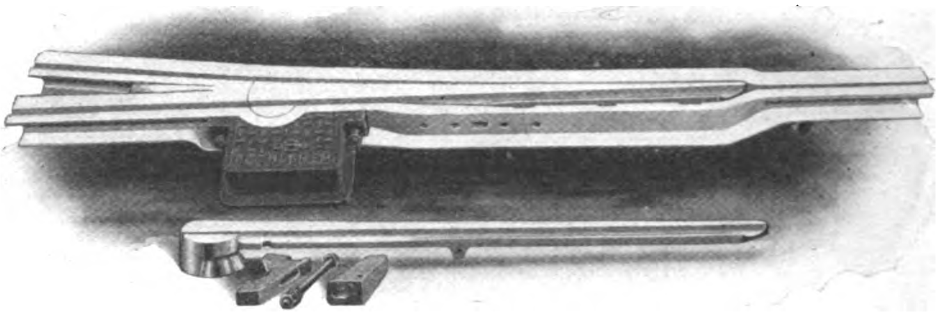
Nichrome is the registered Trade Mark of
alloy products made by the

DRIVER-HARRIS COMPANY
HARRISON, NEW JERSEY
Chicago - Detroit - Canada - England - France

TRADE MARK REG. U.S. PAT. OFF.

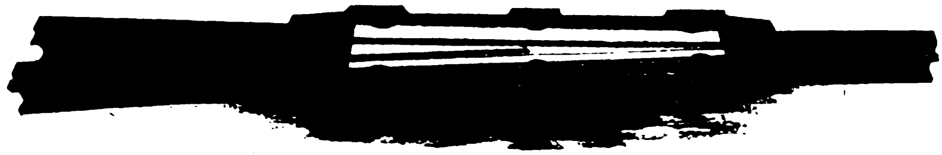
Nichrome

Track Recommendations for 1924



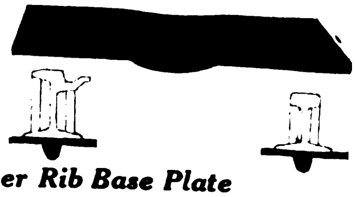
Solid Manganese Tongue Switch, Design 905

This switch is of the improved "Big Pin" type, providing maximum bearing surface or support at the heel. The positive action of hold-down block resists any tendency of the tongue to rock under side thrust, or kick up at the point due to the pounding action o car wheels. The extra large box at the heel of the tongue provides ample room for easy adjustment and quick cleaning.



Hard Centre Mate, Iron Bound Type, Design 923

The mate illustrated above is provided with a heavy manganese steel wearing plate three inches thick held firmly to the carefully machined bed of the mate body by heavy stud bolts of heat-treated Mayari chrome-nickel steel. The entire construction is unusually heavy and substantial.

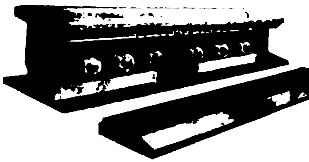


Center Rib Base Plate

This design provides the maximum stiffening reinforcement directly under the rail joint. It supports the joint and prevents battering or cupping of the rail ends.

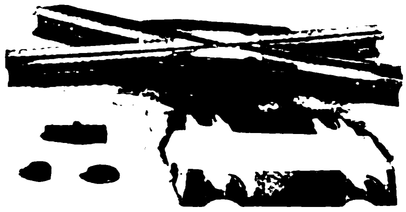
Abbot Base Plate

This plate serves the same purpose as the Center Rib. In this case the reinforcement is on each side instead of in the center.



Machine Fitted Joint Design 983

Joint illustrated above is accurately machined top and bottom to fit any rail section. The special bevel top and bottom is provided for electric arc welding.



Hard Center Frog, Iron Bound Type, Design 942

This hard center frog is of the same construction and offers the same advantages as the mate described above. Particular attention is called to the large bearing area of the plate.

Rolled Steel Alloy Crossing, Design 960

This rolled steel crossing is made of a special rolled Mayari chrome-nickel steel rail. The head of the rail is rolled full, the flangeways machined to any desired depth and then heat-treated to withstand wear. The rails are iron-bound into one solid piece, flange bearing throughout. This crossing may be welded after wear has developed.

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

Sales Offices:
New York Buffalo Boston Cleveland Philadelphia Detroit Baltimore Cincinnati Chicago Washington St. Louis Atlanta San Francisco Pittsburgh

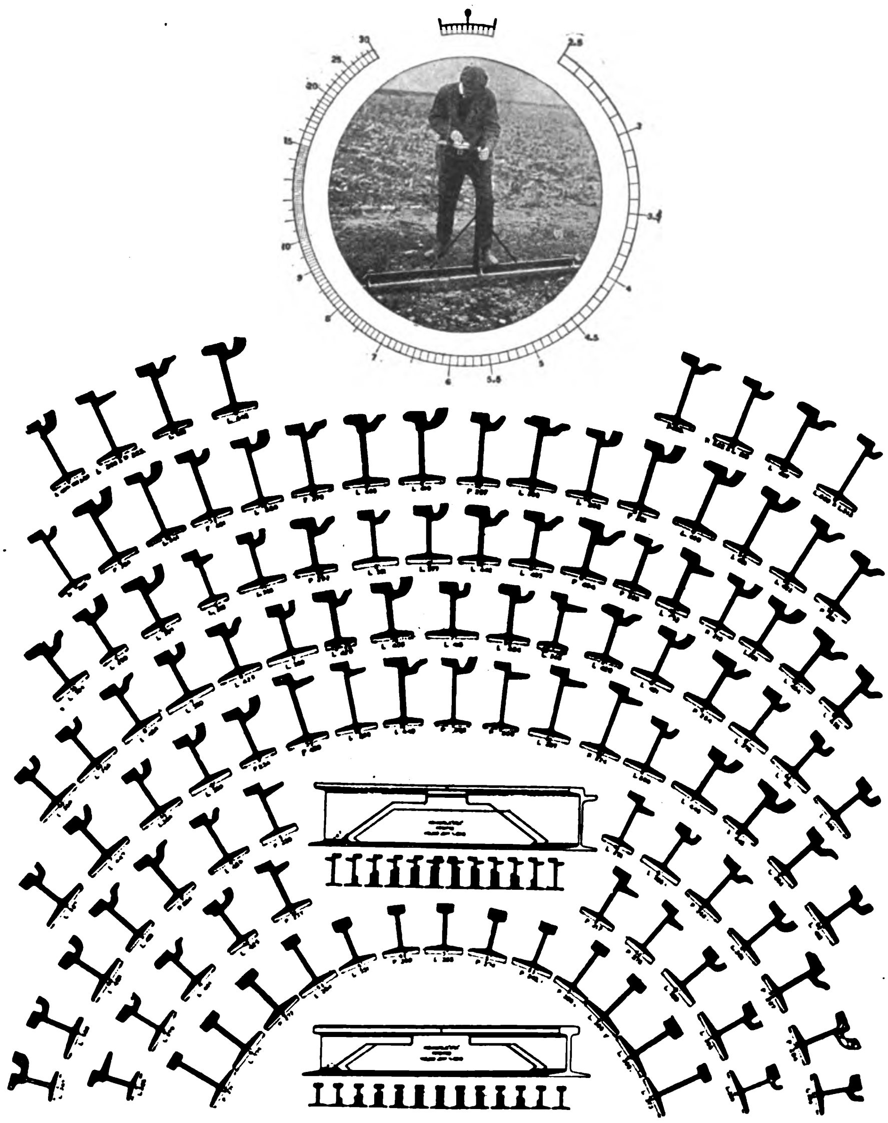
Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM

ROLLER-SMITH BOND TESTERS
for ANY rail-head—EVERY rail-head

It makes no difference in your bond testing if you use a

ROLLER-SMITH BOND TESTER



(Courtesy Indianapolis Switch & Frog Co.)

Bar in place on "T" Rail Showing Saw Blade Contact

Practical and efficient bar contacts

Equipped with saw-tooth contacts which "bite" into any rail-head, the Roller-Smith Bond Tester makes short and easy work of this important maintenance problem. The two types of contact supplied are illustrated herewith. Roller-Smith Bond Testers are small, compact, light, and simple to operate. One man can handle this equipment with ease.

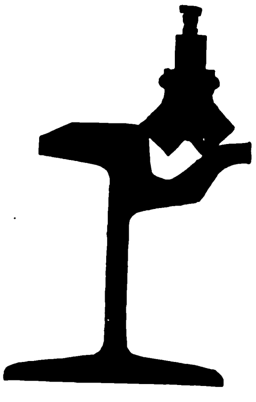
Write for Bulletins G-200 and G-201.

ROLLER-SMITH COMPANY
Electrical Instruments, Meters and Circuit Breakers

2128 Woolworth Bldg.
NEW YORK

Works
BETHLEHEM, PA.

Offices in Principal Cities in U. S. and Canada



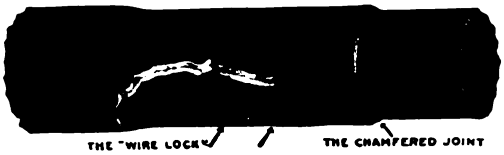
Bar in Place on "Girder" Rail Showing Saw Blade Contact

SPAN WIRE
E.R.E.CO.

ELRECO POLES

Lowest Cost
Least Maintenance
Lightest Weight
Greatest Adaptability

SPAN WIRE
E.R.E.CO.



Elreco Tubular Steel Poles

Joints 100% Efficient

Our patented wire lock swedge joint gives the tubular steel pole unquestioned superiority for electric railway service.

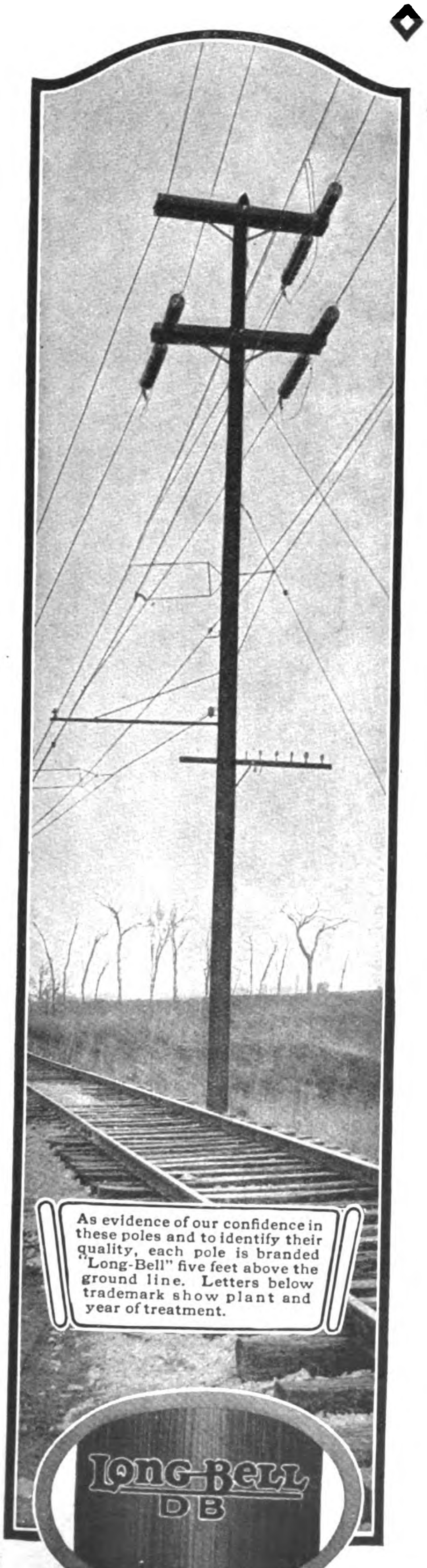
The circular cross-section of a tube develops maximum strength in all directions, and this patented joint construction makes the joints equally strong. They are non-telescoping and non-collapsible.

Note the chamfered edge which prevents the collection of moisture and dirt at the joint, thereby making it corrosion-proof.

Specify Elreco Tubular Poles

Electric Railway Equipment Co.
Cincinnati, Ohio
New York City, 30 Church Street

Eliminate Traffic Interruptions Due to Pole Failures



As evidence of our confidence in these poles and to identify their quality, each pole is branded "Long-Bell" five feet above the ground line. Letters below trademark show plant and year of treatment.

IN Long-Bell Creosoted Yellow Pine Poles electric railway companies have dependable allies in eliminating traffic delays caused by pole failures. These poles of quality combine strength and durability in full measure, with the added advantages of economy and good appearance.

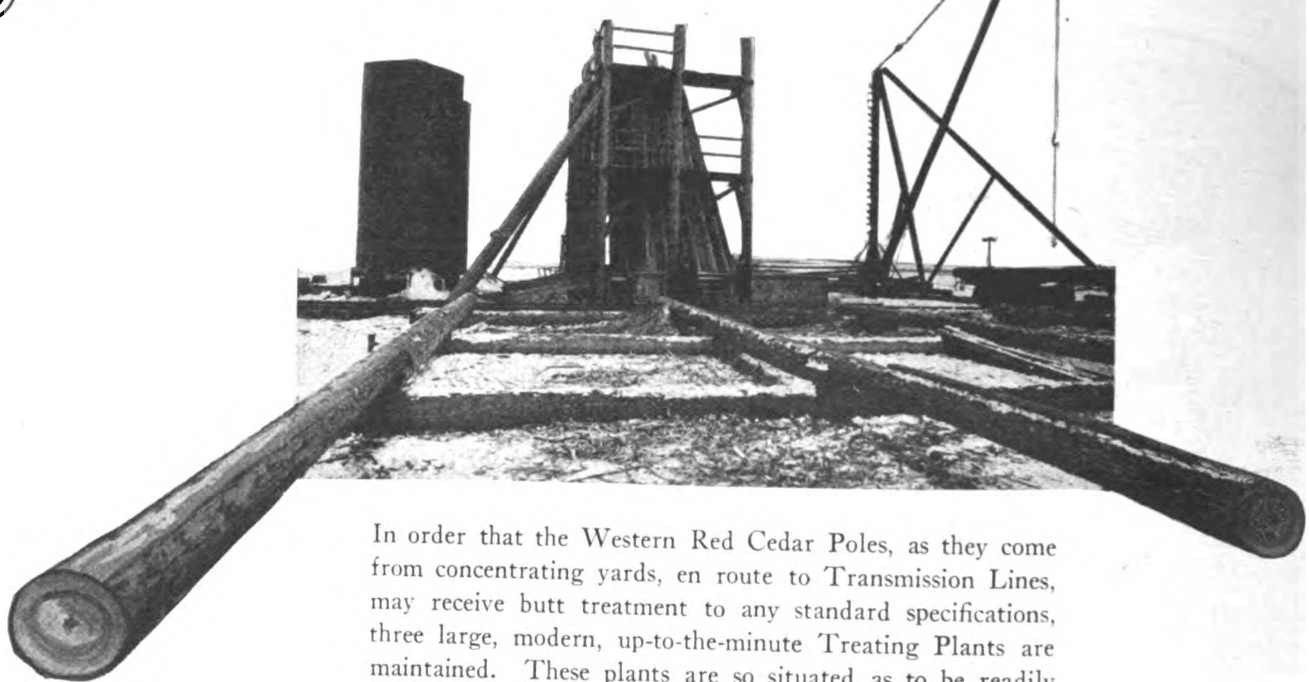
The Yellow Pine of Long-Bell Poles possesses unusual breaking, bending and shearing strength because it is air-seasoned before treatment. This strength is made permanent by treating, full length, with best grade English Creosote Oil, which fortifies each pole against decay and fire. Once placed, they are there to stay! Because Long-Bell Poles are straight, smooth and uniform, they lend attractiveness to the right-of-way—an aid in gaining the approval and good will of the public.

Further Information and Prices will be gladly sent on request.

The Long-Bell Lumber Company
1248 R. A. Long Building Kansas City, Mo.

LONG-BELL
Creosoted Yellow Pine Poles

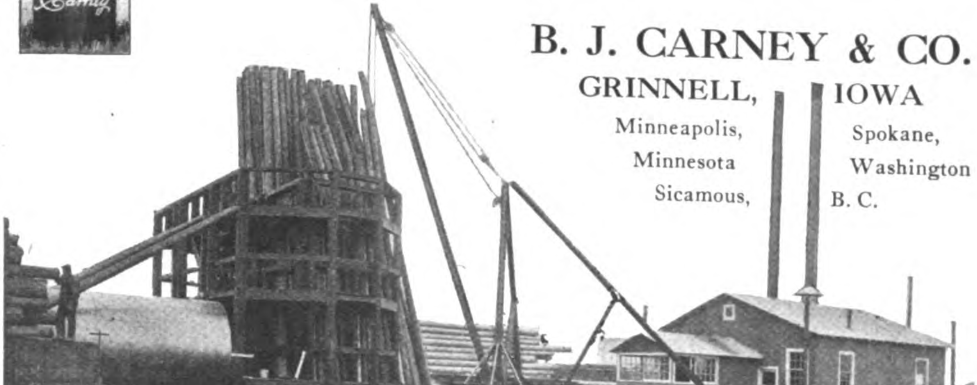
Carney's WESTERN RED CEDAR
Treating Plants

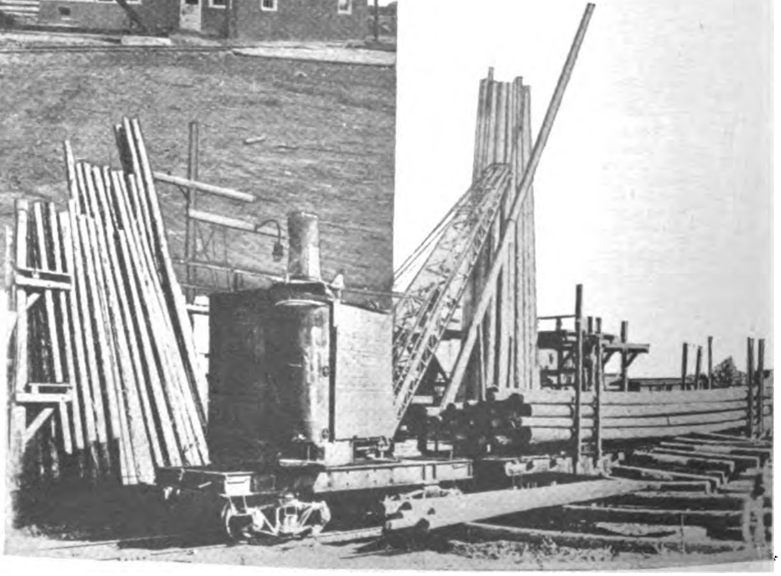


In order that the Western Red Cedar Poles, as they come from concentrating yards, en route to Transmission Lines, may receive butt treatment to any standard specifications, three large, modern, up-to-the-minute Treating Plants are maintained. These plants are so situated as to be readily accessible from concentrating yards on direct hauls and from which shipments can be made to any point with dispatch. Such facilities make it possible to avoid crowding any one plant and allow even distribution of poles, thus facilitating service; and service is the thing!

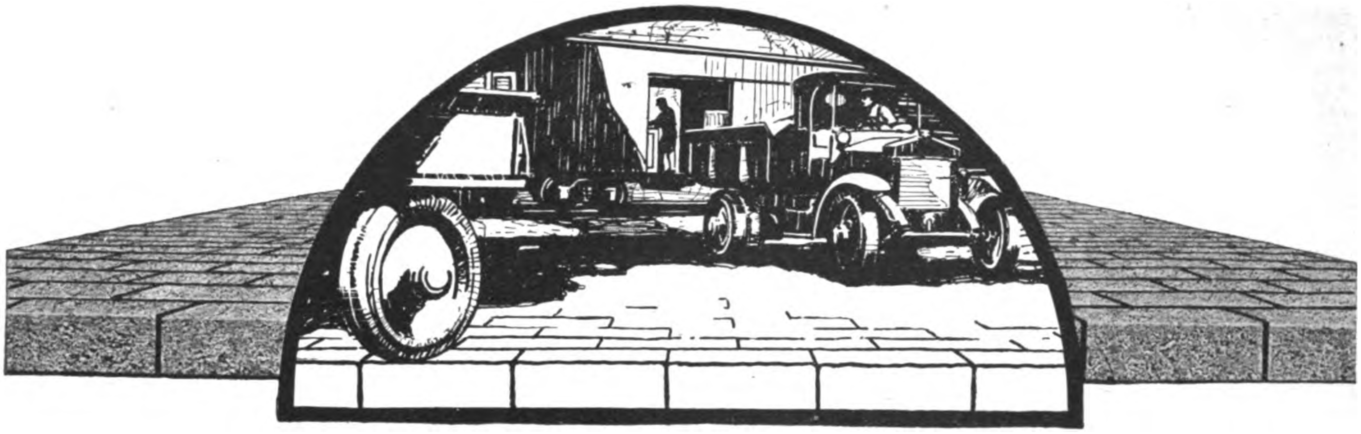
PENTREX
guarantees ⅝ or ½ inch penetration on every pole.

B. J. CARNEY & CO.
GRINNELL, IOWA
Minneapolis, Minnesota
Spokane, Washington
Sicamous, B. C.





Top view is of our Yardley Treating Plant at Spokane, Washington. The center photo is that of our new Treating Plant at Minneapolis, Minnesota. Lower scene shows view of the Sandpoint, Idaho, Treating Plant.



The pound-pound-pound of traffic

THE crash and jolt of heavy truck wheels over your tracks play quick havoc with the paving between them unless it is tough yet elastic.

Vitrified brick, asphalt filled, is the one surfacing material which withstands impact, water-seals your road bed, and is easily removable for track repairs at so reasonable a cost.

And the annual upkeep is least through its long years of service.

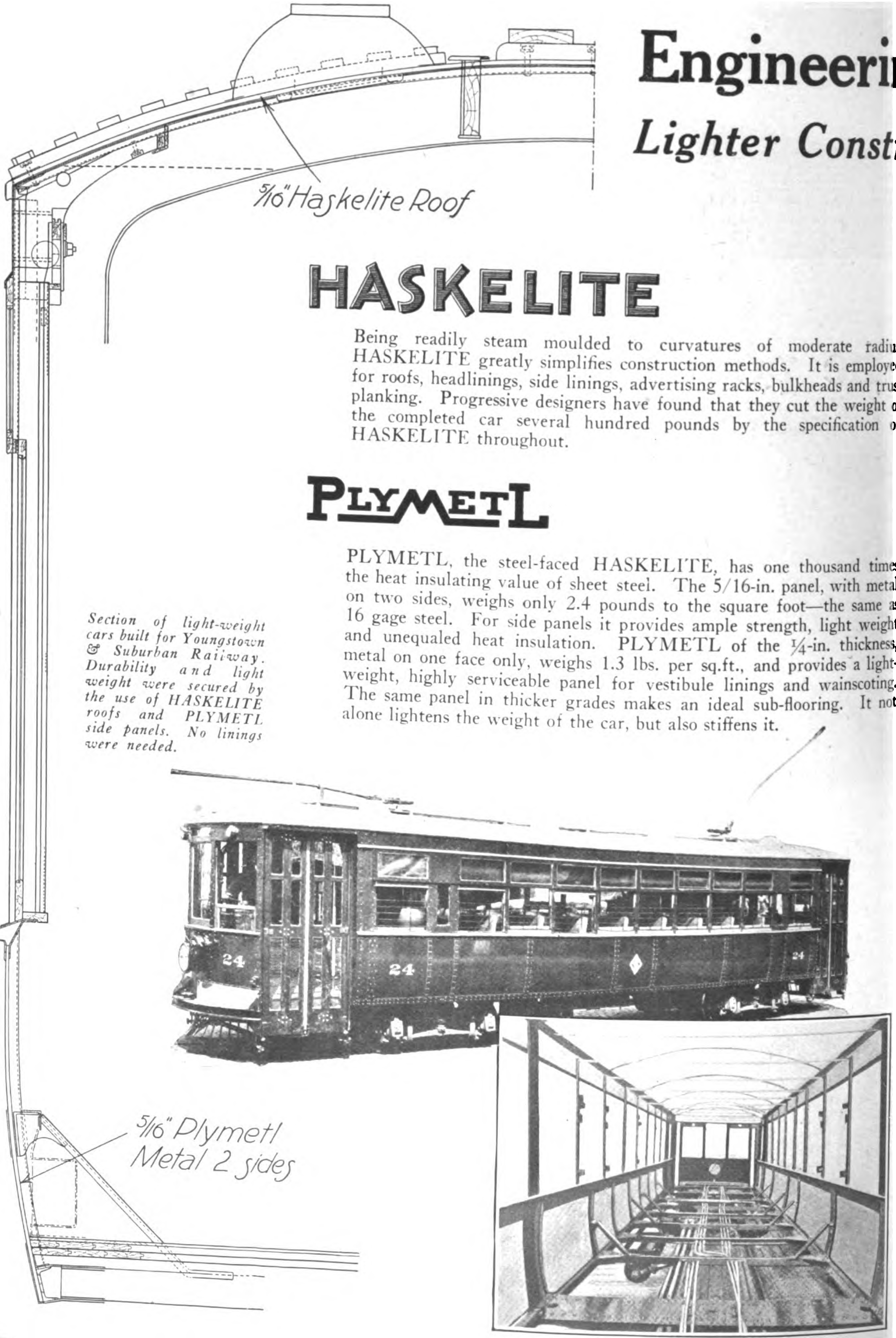
Suitable specifications on request.

NATIONAL PAVING BRICK
MANUFACTURERS ASSOCIATION
ENGINEERS BUILDING CLEVELAND, OHIO

VITRIFIED
Brick
PAVEMENTS
OUTLAST THE BONDS

Engineering

Lighter Construc



HASKELITE

Being readily steam moulded to curvatures of moderate radius, HASKELITE greatly simplifies construction methods. It is employed for roofs, headlinings, side linings, advertising racks, bulkheads and truss planking. Progressive designers have found that they cut the weight of the completed car several hundred pounds by the specification of HASKELITE throughout.

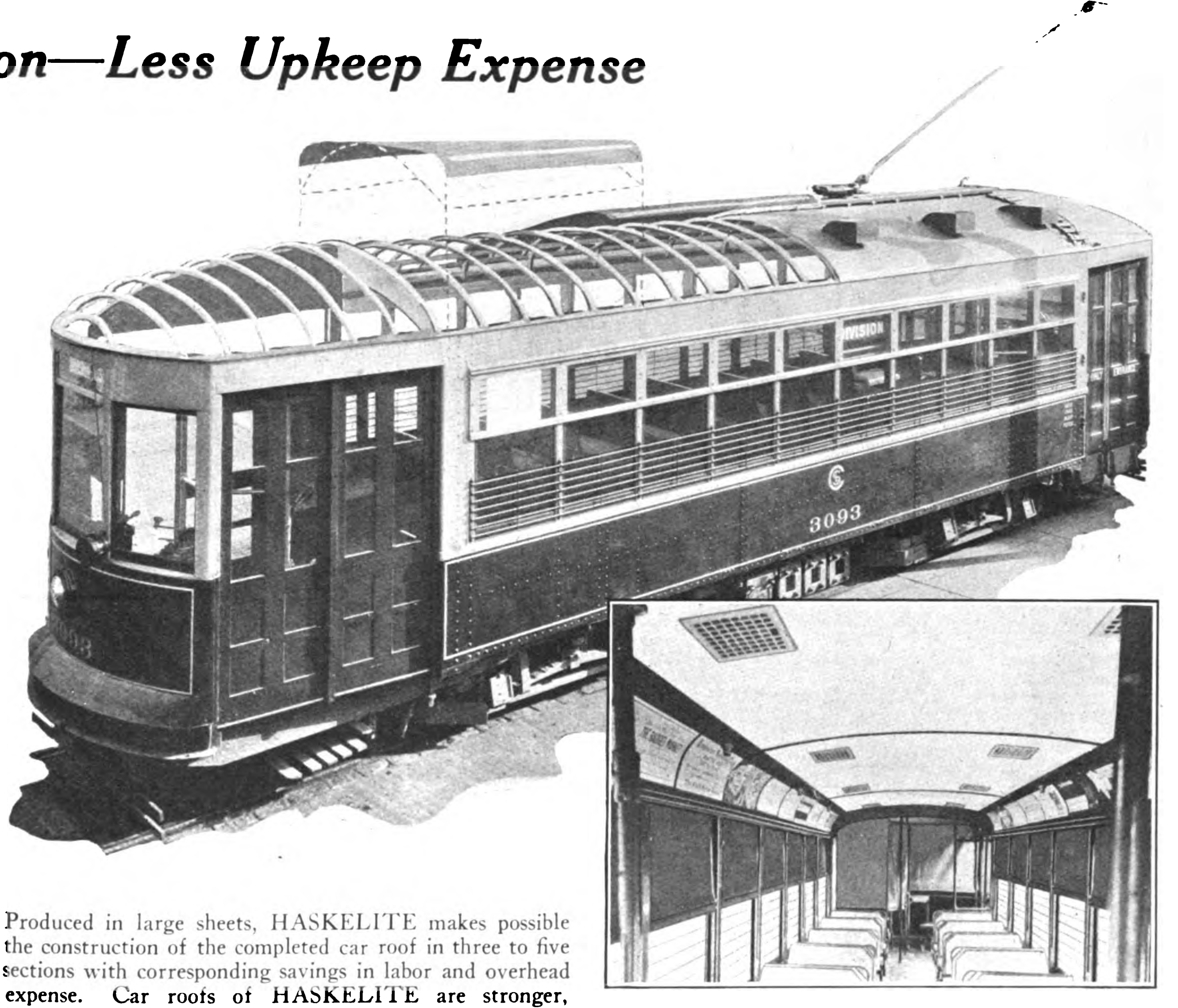
PLYMETL

PLYMETL, the steel-faced HASKELITE, has one thousand times the heat insulating value of sheet steel. The 5/16-in. panel, with metal on two sides, weighs only 2.4 pounds to the square foot—the same as 16 gage steel. For side panels it provides ample strength, light weight and unequaled heat insulation. PLYMETL of the 1/4-in. thickness, metal on one face only, weighs 1.3 lbs. per sq.ft., and provides a light-weight, highly serviceable panel for vestibule linings and wainscoting. The same panel in thicker grades makes an ideal sub-flooring. It not alone lightens the weight of the car, but also stiffens it.

Section of light-weight cars built for Youngstown & Suburban Railway. Durability and light weight were secured by the use of HASKELITE roofs and PLYMETL side panels. No linings were needed.

Materials for Car Bodies

tion—Less Upkeep Expense



Produced in large sheets, HASKELITE makes possible the construction of the completed car roof in three to five sections with corresponding savings in labor and overhead expense. Car roofs of HASKELITE are stronger, lighter and less easily damaged than any other type of roof. Actual service records show that the HASKELITE roof is much less expensive to repair than the T & G construction. As contrasted with the latter, HASKELITE is comparatively free from joints and consequently there is less trouble experienced due to leaky roofs.

For headlinings the 3/16-in., 3-ply HASKELITE combines light weight with flatness and ease of permanent finish. This grade weighs approximately ½ lb. per sq. ft., and as in the case of the thicker panels it can be steam moulded to curved shapes. Weight for weight, HASKELITE headlinings are stronger and more serviceable than any kind of wood fibre.

New light weight cars in many sections of the country have roofs and linings of HASKELITE. Likewise experience has shown that PLYMETL furnishes an ideal material for side linings, vestibule linings and sub-flooring.

Valuable data on the engineering properties of HASKELITE and PLYMETL are contained in a booklet which will be sent free upon request. You should be informed on this valuable material. Send for your copy today.

HASKELITE

and

PLYMETL

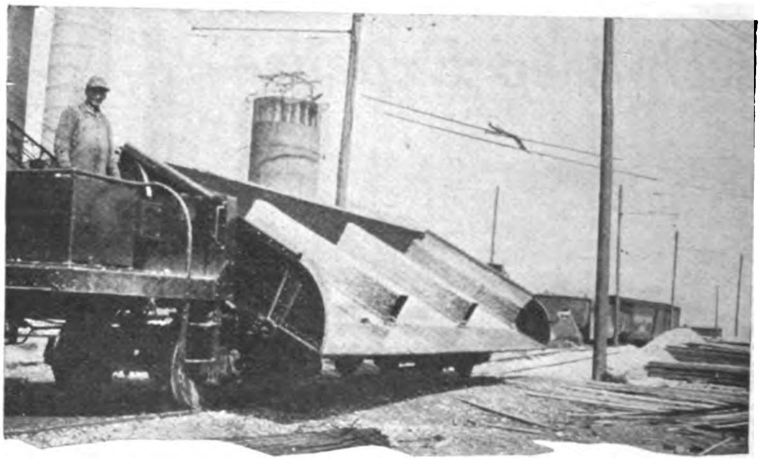
for

STREET CARS

HASKELITE MFG. CORPORATION
CHICAGO

HASKELITE
Manufacturing Corporation
Chamber of Commerce Building, Chicago, Illinois

DIFFERENTIAL MAINT

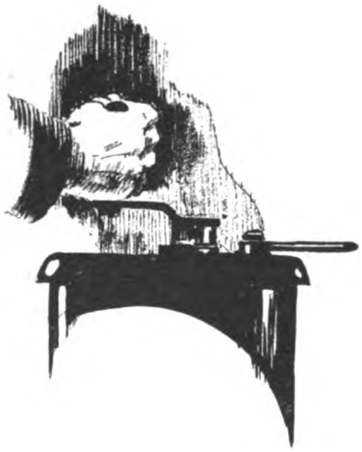


Differential Door Chute Car

It's all automatic—

One hand on the controller does the whole business—moves the body horizontally, tilts it, turns down the side doors—and then reverses the process when the load is dumped.

More roads are joining the ranks of Differential users every week. Over fifty companies now using from one to twenty-five Differentials each.



The only labor is at the controller

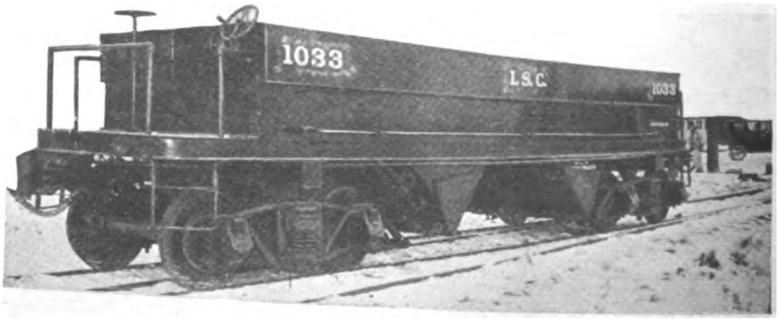
The work car of a dozen uses:—

Track Construction
Track Maintenance
Handling Coal
Ash Disposal
Hauling Freight
Snow Plowing
Snow Removal
Quarry Service
Highway Construction
Laying Paving

As an Electric Miscellaneous Haulage Locomotive

We Build the CLARK CONCRETE BREAKER

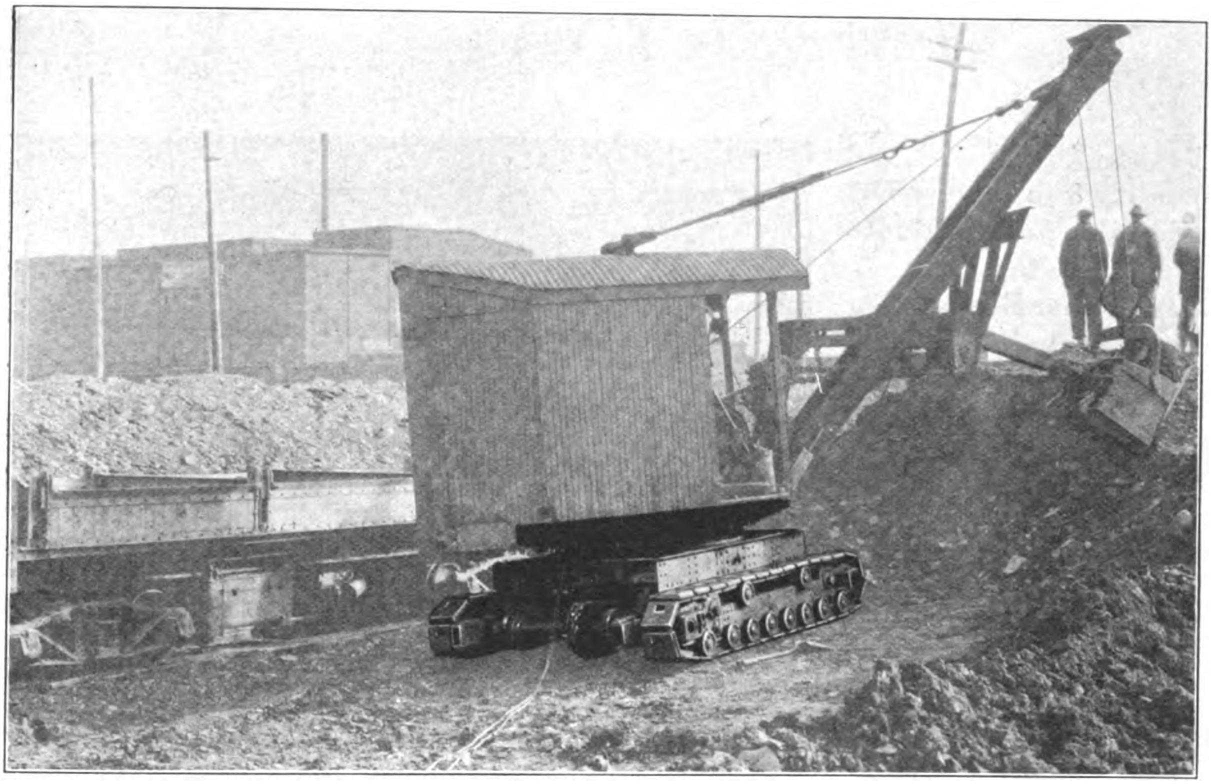
Our Bulletin D-11 describes it. Write for it.



The Differential Bottom Dump Ballast Car

ENANCE NECESSITIES

Here's a new Differential device



COMBINATION CAR-WHEEL TRUCK and TRACTOR

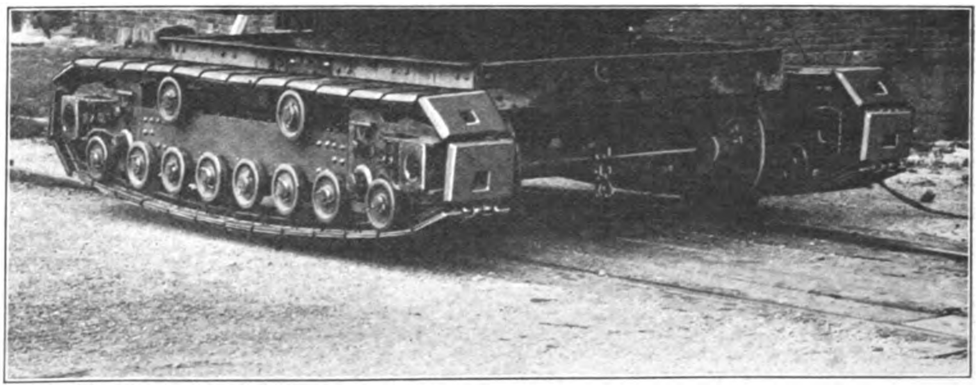
Runs on ruts or rails—

Power shovels, concrete mixers and other heavy construction equipment can literally wade into any job, anywhere, when fitted with this Combination Car-Wheel Truck and Tractor. Your tools need not be tied down to tracks—you needn't obstruct your street-car traffic.

For full description—ask for Bulletin D-10!

Continuous digging on tractor treads.

Easily transported on car wheels.



The DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO.

Type ET Brazed Bond

Samples of
Applied Terminals
On Request

8 to 1
Contact Area Ratio
Steel Rail to
Copper Bond

Type ET, terminal cut from rail

Permanently low contact resistance

of Erico Brazed bonds guarantees a high trolley voltage. Your power goes into useful work in the car motors instead of heating the rails. That means a substantial saving in power costs.

In these trying days of bus and jitney competition, this saving in power cost alone may mean the difference between red and black figures on your 1924 financial statements. But the saving that Brazed Bonds insure does not end here. Higher voltage on the trolley wire means higher speed on the level and on grades, faster schedules, less motor depreciation—higher efficiency, and lower operating costs.

Many electric railways are now cashing in on these substantial savings. Each year more and more systems, both large and small are selecting the Brazed Bond because competition in transportation is forcing real efforts toward maximum operating efficiency, and the positive economy assured by the Brazed Bond is recognized. Your own track rehabilitation and bonding will be under way within a month or two—

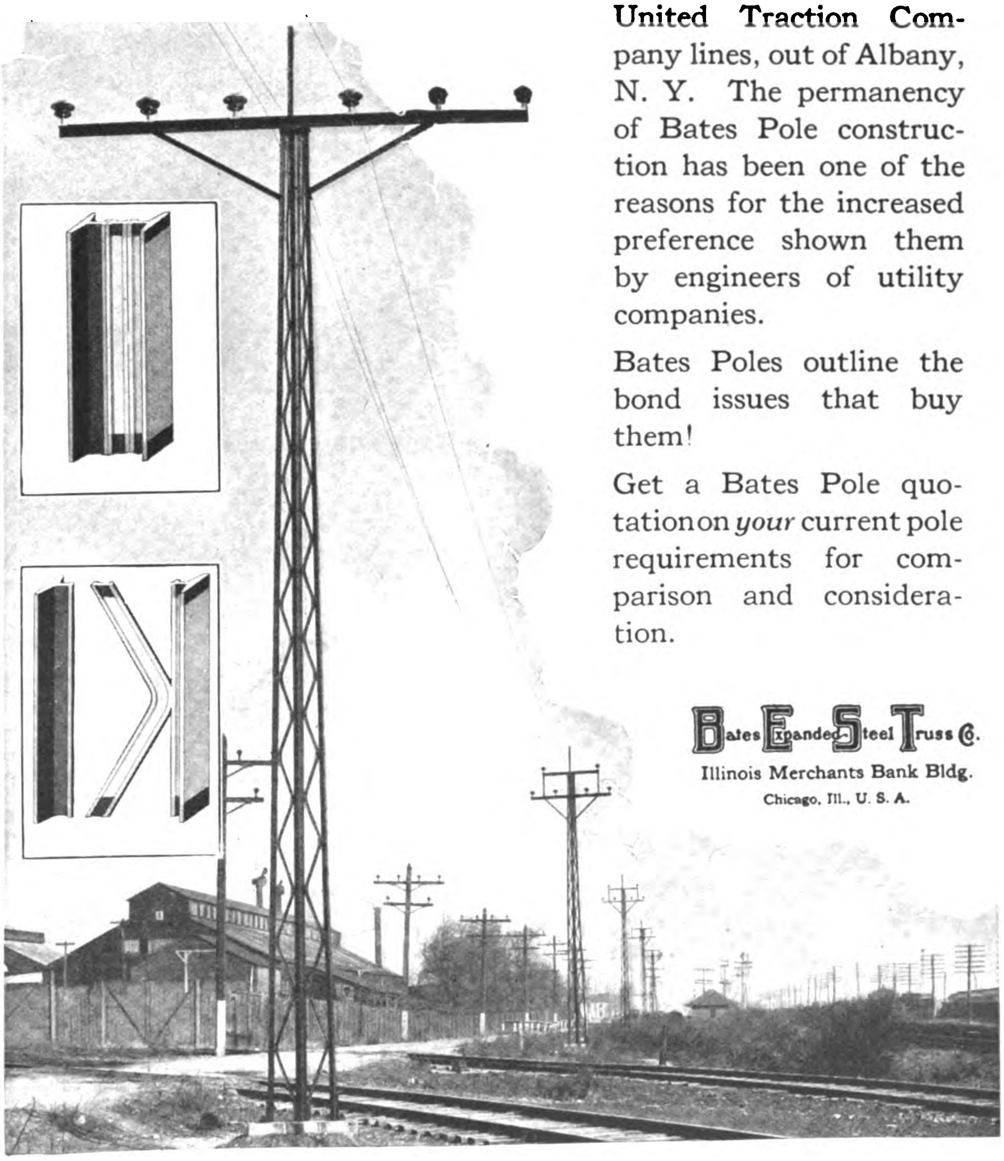
Will you pass up the advantages Brazed Bonds offer?

The Electric Railway Improvement Co.
Cleveland, Ohio

Brazed ERICO Bonds

The Line of the Least Resistance

Bates Poles on the United Traction Company Lines at Albany, N. Y.



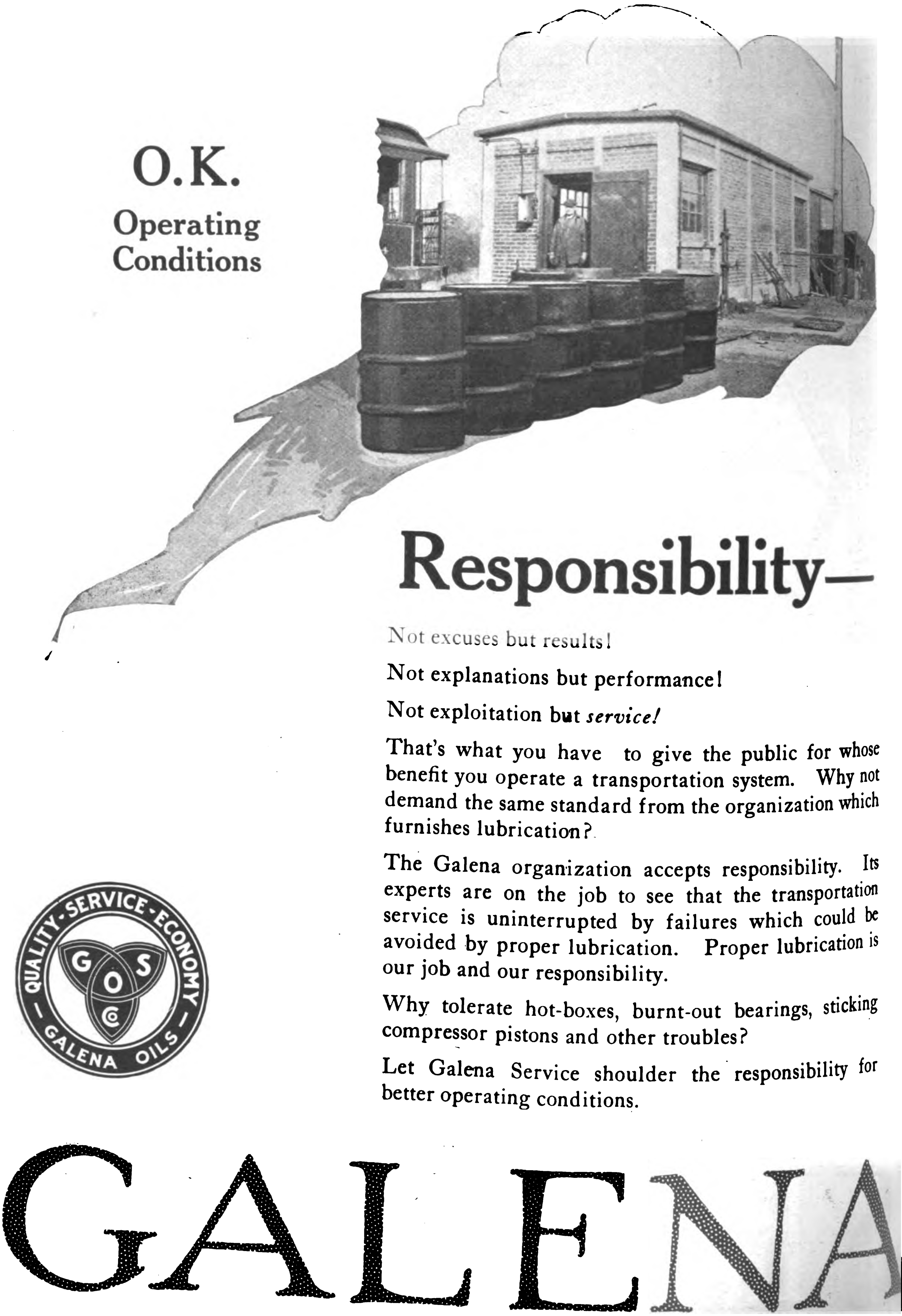
Bates Poles are pictured at a crossing on the United Traction Company lines, out of Albany, N. Y. The permanency of Bates Pole construction has been one of the reasons for the increased preference shown them by engineers of utility companies.

Bates Poles outline the bond issues that buy them!

Get a Bates Pole quotation on *your* current pole requirements for comparison and consideration.

Bates Expanded Steel Truss Co.
Illinois Merchants Bank Bldg.
Chicago, Ill., U. S. A.

BATES ONE PIECE EXPANDED STEEL POLES



O.K.
Operating Conditions

Responsibility—

Not excuses but results!

Not explanations but performance!

Not exploitation but *service!*

That's what you have to give the public for whose benefit you operate a transportation system. Why not demand the same standard from the organization which furnishes lubrication?

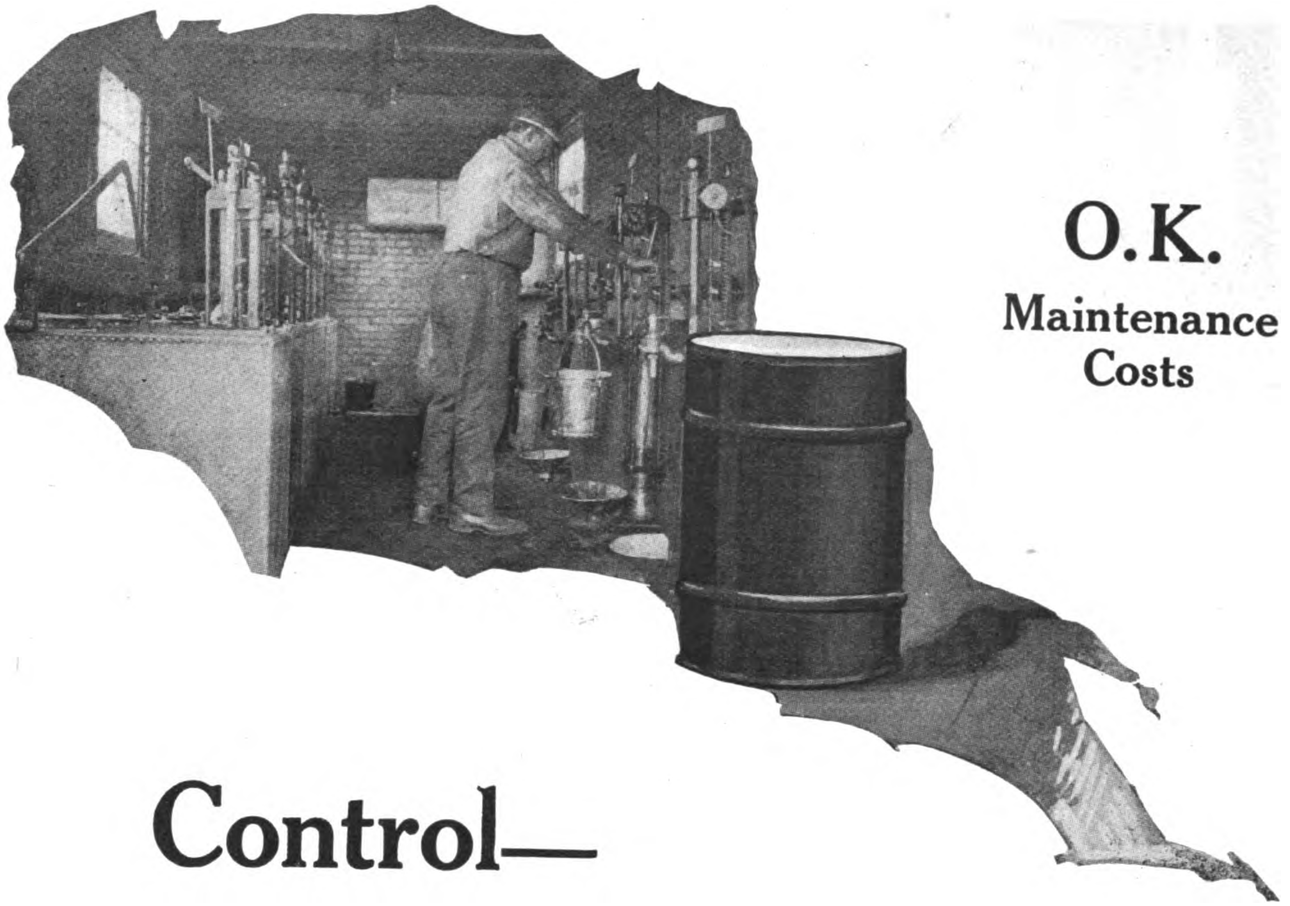
The Galena organization accepts responsibility. Its experts are on the job to see that the transportation service is uninterrupted by failures which could be avoided by proper lubrication. Proper lubrication is our job and our responsibility.

Why tolerate hot-boxes, burnt-out bearings, sticking compressor pistons and other troubles?

Let Galena Service shoulder the responsibility for better operating conditions.

QUALITY · SERVICE · ECONOMY
G O S C
— GALENA OILS —

GALENA



O.K.
Maintenance Costs

Control—

Correct grades of lubricant, used in quantities accurately determined for best results, together with a continual check-up on wear of bearings, gears and pinions, and other vital parts, these constitute real control of lubrication and maintenance costs.

Not by the price of oil alone, are actual costs determined. Galena lubrication service is more far-sighted. Every man in the Galena organization works on the basis that the "long-run" cost reduction is what renews the Galena contracts, year after year.

It's the constant control, that cuts the maintenance costs.

Galena-Signal Oil Company
FRANKLIN, PA.
NEW YORK **CHICAGO**
and offices in all principal cities

QUALITY · SERVICE · ECONOMY
G O S C
— GALENA OILS —

SERVICE

UNA
WELDING ROD

Welding Una Rail Joint by "Hand-feed Process" of Welding.

Taking the Mystery Out of Welding Rod

In a seam welded Rail Joint, under the conditions of the arc, the filler rod must do essentially two things—first, it must assure a uniform weld throughout the weld area of plate and rail and second, the resulting seam metal must be homogeneous, ductile and highly resistant to impact.

To produce a welding rod with these characteristics is not a matter of mere guess-work. Certain reactions take place in welding a seam with the arc. It was a study of these reactions, under the peculiar conditions of the arc that led to the development of Una Rod, 200.

The composition of this rod definitely determines the properties of the seam metal. The reactions which take place are somewhat similar to those in the manufacture of steel when certain elements are added to the molten metal to produce the properties desired. That is exactly what Una Welding Rod does, under the conditions of the arc.

HIGH DUCTILITY AND RESISTANCE TO IMPACT

The following table shows the outstanding superiority of Una Rod, 200—against a very high grade of low carbon steel:

	Low Carbon Rod	*Una Rod, 200.*
Weldability	**Fair**	**Excellent**
Flowing Properties	**Good**	**Excellent**
Ductility	**1.0**	**2.08**
Resistance to Impact	**1.0**	**2.20**

Ductility and Resistance to impact are the essential properties of a good seam metal. The more ductile and the more resistant to impact the seam metal, the longer its life under service conditions. Una Rod, 200 produces seam metal with a ductility and resistance to impact more than double that of the highest grade of low carbon steel.

RAIL WELDING AND BONDING COMPANY
CLEVELAND, OHIO
Manufacturers of
UNA BONDS

ENGINEERING DATA FOR CAR EQUIPMENT MAINTENANCE
GENERAL ELECTRIC COMPANY
RAILWAY SUPPLIES
NERAL ELECTRIC COMPANY SCHENECTADY N.Y.
VAL PARTS FOR QUIPMENT
GENERAL ELECTRIC COMPANY

A Complete Service

For years the General Electric Company has encouraged high standards for railway apparatus and supplies. It has persistently emphasized the wisdom of maintaining good equipment with supply parts equally as good. It has spared no effort in guiding electric railways in the selection of modern equipment; in giving helpful suggestions on proper operation and maintenance; and in facilitating maintenance by supplying duplicate parts to perpetuate the quality built originally into equipment—a complete, permanent service to the industry.

General Electric
Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40 342

GENERAL ELECTRIC

RAILWAY
SUPPLIES
GENERAL ELECTRIC COMPANY
SCHENECTADY, N.Y.
Air brakes
Bonds

Chapters on:

Motors and controllers
Protective devices
Air brake equipment
Current collectors
Lighting and wiring supplies
Electric fans
Insulating materials
Repair shop tools and facilities
Overhead line material
Rail bonds and bonding tools

Your Guide
to New and Better Standards

Another car is pulled in—motive power out of commission—inferior arresters have failed again. The engineer turns to his G-E Catalog and finds complete data on proper G-E Arresters which would have protected—and which will be installed.

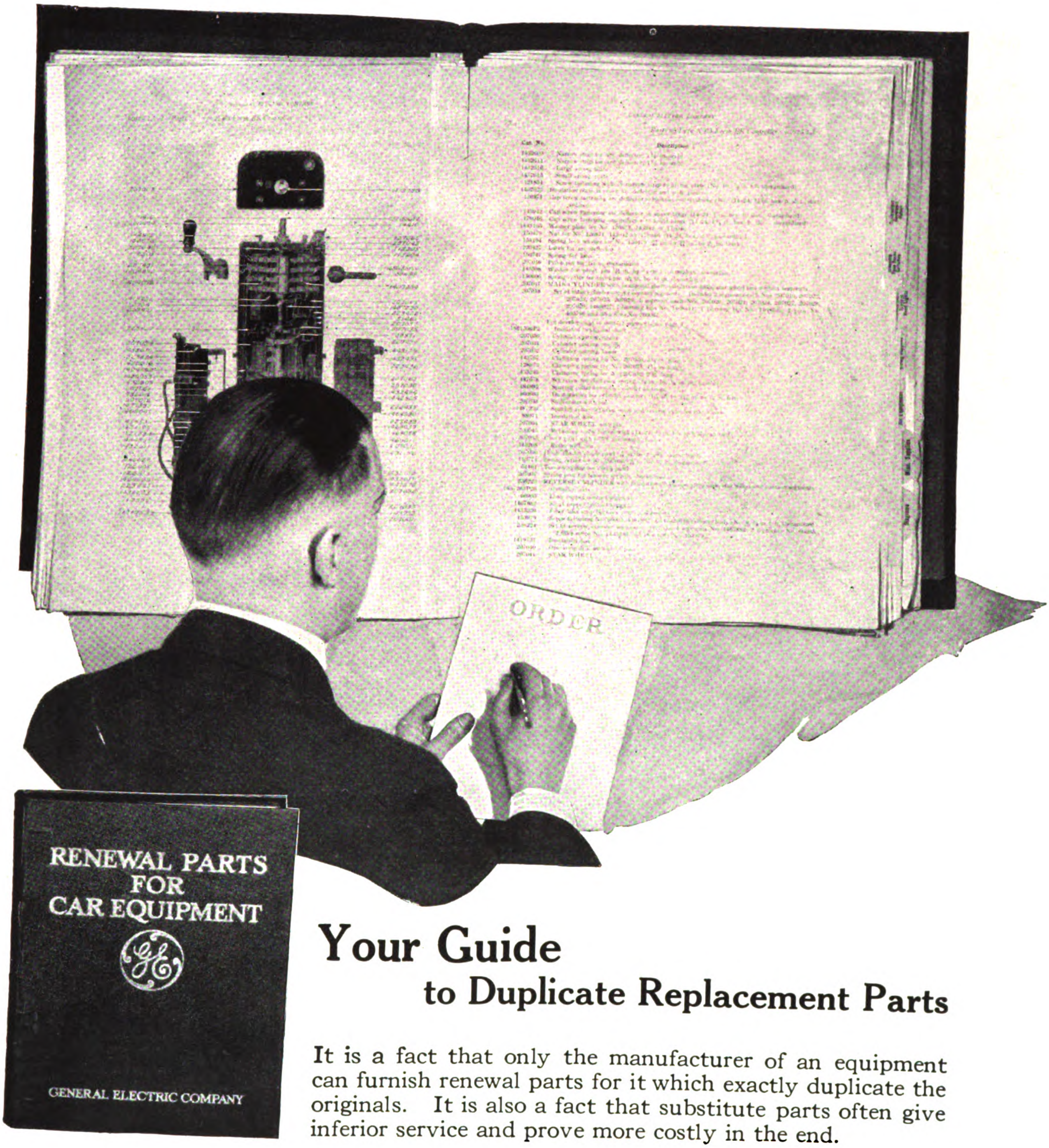
Thus, the G-E Railway Supply Catalog guides electric railways in the *selection* of modern equipment—and supplies. Every road in this country has a copy; railway men regard it a great step toward more uniformly high standards.

Those, if there be any, who are not using their Catalog need only be reminded of the wealth of information it contains. Keep your copy near.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-341

GENERAL ELECTRIC



Your Guide
to Duplicate Replacement Parts

It is a fact that only the manufacturer of an equipment can furnish renewal parts for it which exactly duplicate the originals. It is also a fact that substitute parts often give inferior service and prove more costly in the end.

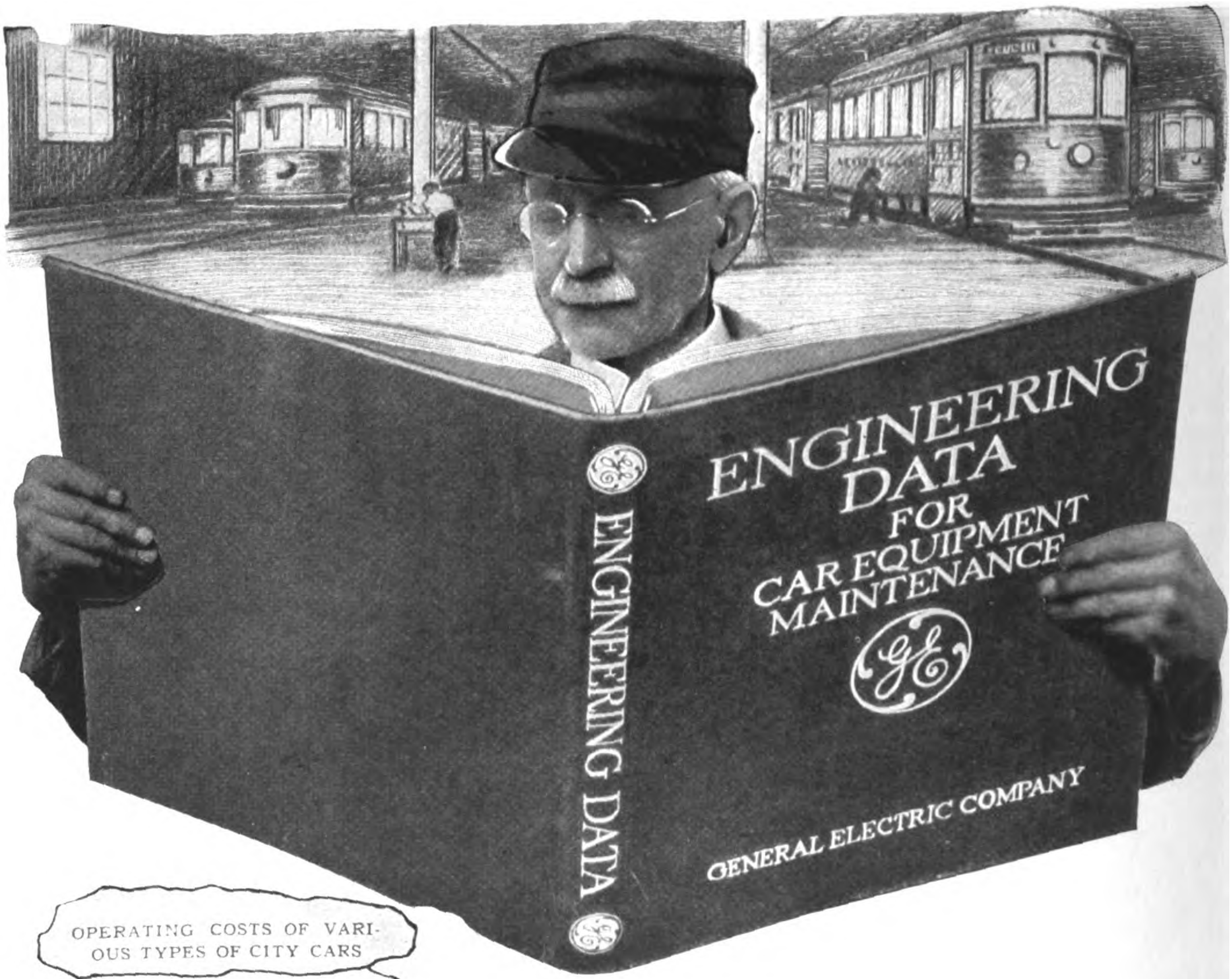
Therefore, it is good business to maintain good equipment with the only parts which you can be sure are equally as good—exact duplicates. To help you adhere to such a policy is the function of your G-E Renewal Parts Catalog.

In short, "Original Equipment Quality" is the only safe standard for purchasing repairs. Stick to your G-E Renewal Parts Catalog and you stick to that standard.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-344

GENERAL ELECTRIC


ENGINEERING DATA
ENGINEERING DATA FOR CAR EQUIPMENT MAINTENANCE
GENERAL ELECTRIC COMPANY

OPERATING COSTS OF VARIOUS TYPES OF CITY CARS

Caring for D-C. Aluminum Car Arresters During the Winter

Testing of Railway Motors

ADJUSTMENT OF DRUM CONTROLLER FINGERS

Roof Wiring for Circuit Breakers

Repair of Railway Motor Commutators

Methods of Removing the Armature from Box-frame Railway Motors

Your Guide

to Car Equipment Maintenance

The electric railways have long appreciated the assistance afforded them by the special G-E Renewal Parts Catalogs supplied for years with G-E Equipment.

They regard their big G-E Railway Supply Catalog as an aid particularly in establishing proper standards.

Much other information, in various forms, has gone out as helpful suggestions to those directly in charge of the upkeep of equipment. This particular service will be continued, but is being still further improved. It is now centralized in the G-E Engineering Data Book which becomes your permanent guide to proper operation of car equipment and its maintenance.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-345

GENERAL ELECTRIC

New York, March 22, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

Volume 63
Number 12

Electric Railway Shops Are Behind the Times

A SILENT and little known but vitally important element that contributes much to the success or failure of the electric railway is the car repair shop. Even the management of the road is not always conscious of the part it plays in rendering adequate and reliable service at all times and under all conditions.

In the past few years attention of managements has been focused on the necessity for the use of modern, light-weight equipment. This has proved a good investment in practically every case, and a good advertisement for the railway purchasing it.

Often it is argued that the new cars require less maintenance, and so it is not necessary to have as complete shop equipment as for the older types of cars. There is a fallacy in this. Since the new cars almost invariably represent a much greater investment than the ones they replace, and since they have a greater earning power than their predecessors, it is doubly important that they be kept in active service as great a portion of the time as possible. While the repairs when the cars are brand new may be minor, the excellence with which the work is done at that time will determine to a considerable extent how long they can go without undergoing heavy repairs.

Modern shop equipment is available that makes it possible to handle the cars in the shop much more quickly, and to do the necessary repair work with far greater facility and at less cost, than the equipment used by past generations. Yet many shops are using tools that were purchased twenty or more years ago. In fact, in the survey carried out by the ELECTRIC RAILWAY JOURNAL and published in this issue, it was developed that but one-third of the shop tools of small, medium-sized and large properties were less than ten years old.

When it is considered that the period beginning with the commencement of the World War ten years ago has seen a most remarkable improvement of machine tools, particularly along the lines of more rapid production and greater precision of work, this statement indicates that the electric railway shops are even more out of date than is gathered from the figures alone.

The responsibility for this rests partly with the master mechanics, but in a larger measure with the executives who as a rule have listened with a deaf ear to the proposals of the master mechanics for expenditures for modern machine tools in order to reduce maintenance costs. The executives' excuse has been lack of money, but it is believed that that is no longer a good reason. Almost any railway can buy a machine or two a year, at least under present conditions, and gradually place the shop in position to reap the economies that modern tools make possible. For the fear that the electric railway was to be supplanted has passed. We know now that the bus is a supplement, not a substitute. So with this former deterrent out of the way, the shop's modernization program can get under way.

What the Survey of Machine Tools Developed

IT WAS typical of the answers submitted in reply to the questions upon which the JOURNAL'S survey of machine tools in electric railway shops was based, that most of the machine tools were old and few modern and efficient. In fact, some reports listed tools in service that were purchased as much as forty years ago—tools that actually antedate the electric railway itself. Other tools were of uncertain origin, having been in the shops so long that the present management knows nothing of the time or place of their purchase.

Still other replies indicated that second-hand tools had been bought in quantity. Most likely these tools, which had served their purpose for the original purchaser, were already worn or were unsuited to the work for which the road obtained them. Possibly the managements taking this action thought that great care had been used in the selection of the shop equipment, and that considerable money had been saved by getting something "just as good as new." Such tools might be a wise buy as a temporary substitute for the proper equipment, if the roads had not the money at the time to purchase modern equipment. But when such tools are continued in use for many years without thought of replacement, it does not indicate that the management has a clear idea of the functions of the mechanical department or of its importance in relation to the net earnings of the road.

Use the Shop Equipment to Good Advantage

PROBABLY the one thing that has been impressed on the shop foreman of the electric railway more than any other is the importance of getting the cars out of the shop without delay. A car in the shop earns nothing, and it is the car, not the shop, that makes the profits.

This attitude frequently has led to practices that are not efficient or economical. If the shop is not equipped with the proper machine tools, or if the tools best fitted to the job are busy on some other work, that is unfortunate, but the car must be turned out somehow! In this way it frequently happens that it is necessary to spend more money and do the work uneconomically and in a makeshift way.

There is a great difference between the electric railway repair shop and the manufacturing plant. While conditions such as those referred to exist in many railway shops, a manufacturing shop must make its products economically or else profits disappear and the factory goes out of business. With proper equipment and organization, however, it is possible to approximate manufacturing shop conditions in the railway repair shop.

The study of machine tool equipment made by this paper points the way to the selection of new, profit saving machines. That helps in one way to get shop costs down. Another remedial measure is to take steps to provide the older machines with modern cutting tools, as far as their strength and power will stand it. The correct form of tool, the proper material for the working part to get the most out of the machine, and the proper adjustment and grinding of the cutting edge, are all necessary. These are things that require little or no capital expenditure, but do take knowledge and skill on the part of the supervisory force.

Another element in reducing shop costs and getting production is a study of the work done in the shop. Nearly every electric railway has forms to be filled out, giving the individual cars held out of service and the reasons therefor. One car will be held for wheels, one for a broken equalizer bar, a third for journal brasses, etc. Of course, any railway with the least semblance of organization has on hand sufficient wheels, brasses, or material for equalizer bars. The real reason for the long periods in which cars are held out of service is not lack of material. It is that the organization, or the machinery, or the tools are in such condition that the necessary machine work cannot be done promptly. Here is where a live equipment man can well afford to devote his attention and determine just where the difficulties are that must be remedied to get the cars out of the shop.

Then the story must be put in proper shape and presented to the general manager in such form that it is a convincing argument for the proper action. Even though the manager does not see his way clear to purchase the much needed equipment and throw out the old machines, it will be to his advantage to know the real condition of his shop and to determine what improvements can be made now or in the near future that will gradually better conditions. More than likely the idea cannot be "sold" by the equipment man the first time, but repetition is necessary and ought ultimately to bring an O.K. Salesmen do not get their orders at the first call, usually, but have to come back again and again. The master mechanics have a selling job to do.

Keeping Records of Machine Tools

IN COLLECTING data relative to the machine tools used in electric railway shops a lack of records of this equipment was found. Some properties had lists of the tools, others had a card index of the machines with their location, type and size, detail dimensions, age, etc. But the majority of properties rely on the memory of someone, usually the master mechanic, for the authentic information as to what this or that machine is and its controlling dimensions and characteristics. This means, of course, that any question arising with regard to a machine can be answered only by taking the data off the machine itself—a practice that makes for delay.

A detailed record of each machine, made at the time it is installed, will facilitate inventories and lend intelligence generally to the use of the machine during its full life.

Rising Labor Costs Make Handling Machines Necessary

WE IN THE United States are justly proud of our high standards of living compared with those in other countries, and we speak with satisfaction of the enviable economic status of the American workman. The present situation is the result of a steady trend toward higher wages and shorter hours, a trend which has continued almost without interruption for many years, but especially since 1914.

In the abstract, this tendency is approved by nearly everyone. In concrete cases, however, approval is likely to be tempered by dismay at the increased labor costs. When increased wages and shorter hours can be arranged without making production more expensive, little opposition is encountered. The development of modern machinery has often made this possible.

In recent years the problem of rising wages has made construction and operating costs an acute problem in the electric railway industry. In the transportation department this has been solved to some extent by the one-man car, and by other means. In the shop, way, and line departments special handling machinery has made the time of the laborer more productive.

Great strides have been taken in this direction during the past few years. Observation on many properties shows that railways have been buying labor-saving machinery of nearly every description, and have found the investment to be well justified by the resultant saving in man-hours.

The collection of pictures from various parts of the country published in an eight-page group in this issue gives one an idea of the scope of materials handling machines which are applicable in the various departments of the electric railway field. Railways have had to conserve their earnings because they could not readily or materially increase their selling price, and this accounts for the great interest in labor-saving machines—an interest that is gaining headway rapidly as experience accumulates to show the savings possible.

An Urge from Headquarters May Improve Publicity

GOOD publicity is considered both necessary and helpful in building better public relations, yet there are many electric railway managements, even at this late date, who are not taking any part in the work. President Budd of the American Electric Railway Association recently said, in speaking to the Midyear Meeting at St. Louis, that any manager who is not doing his share in the general program of public relations work is derelict in his duty to his company and to the industry.

This lack of co-operation might be remedied in many localities if the suggestion were sent out from the main office to the local managers that they should report back periodically as to what they have been doing along these lines. In other words, there has not been the urge from the main office to do these things in many instances. On the other hand, every local manager should insist upon an appropriation for the purpose of executing locally his part in the general program to get a square deal for the electric railways.

40% Are Over 20 Years Old

Only 28% of All Machine Tools Now in Use in Electric Railway Shops Have Been Purchased in the Last Ten Years—"Journal's" Survey of Conditions Shows that at Least 12,500 New Machine Tools Are Needed to Approach Modernization in This Department of the Industry

TO MODERNIZE electric railway shops in the United States, 12,500 new machine tools, including woodworking machines, are needed as a minimum. This is based on the assumption that at the very least all machine tools over 20 years old ought to be replaced. The number of such tools in the shops of the 821 electric railway operating companies is about 10,000, which is 40 per cent of the total number of machine tools of all ages in use in the industry. In addition, 2,500 more new machine tools are required to meet the expressed need of the master mechanics for new tools to supplement their present equipment.

This is believed to be a conservative estimate, because many machines less than 20 years old ought to be replaced too, and because many more new additional machine tools are needed than 2,500, as this number is based on a literal interpretation of the fact that no information on this point was supplied by 53 per cent of the master mechanics reporting.

Such a program as this of new machine tools would require expenditures aggregating some $15,000,000 to $20,000,000, which indicates the magnitude of the task that must be accomplished in modernizing the rolling stock maintenance facilities of the industry. As it is generally conceded that substantial economies are readily possible and would result from such a program, one may get an idea from the figures just read of the magnitude of the savings that are available. Or, to put it another way, one gets some appreciation of the losses which electric railways are suffering by continuing the use of the present obsolete, inefficient and small capacity machine tools.

Táble I—Classification of Machine and Woodworking Tools in Seventeen Electric Railway Shops Maintaining from Twelve to Fifty Passenger Cars

Number passenger cars	12	16	16	22	24	25	26	37	39	42	43	44	46	47	50	50	50
Machine Shop																	
Emery wheel	1	1	1	1	2	1	1	1	2	2	1	2	1	1	3	2	3
Grinding machine	..	1	..	..	..	1	..	1	..	..	1	..	..	..	..	..	1
Grindstone	1	1	1	1	1	..	..	1	1	1	..	..	1	1	1	1	1
Drill press	1	1	1	1	3	2	..	..	2	2	1	2	1	1	2	4	3
Radial drill	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..
Wheel turning lathe	..	..	..	N	1	1	N	N	..	1	..	..	..	1	1	1	1
Heavy turret lathe	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Low swing axle lathe	..	..	..	..	..	..	..	N	..	1	..	..	..	..	1	..	1
Other lathes	1	1	2	1	2	2	1	1	2	1	4	2	3	1	3	4	3
Milling machine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Shaper	N	1	..	1	1	1	1	..	1	1	1	1	1	1	1	1	2
Power hack saw	1	1	1	N	1	1	1	..	1	1	1	1	1	1	1	1	1
Planer	..	..	1	..	1	1	..	..	N	..	1	..	..	..	..	..	1
Punch press	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1
Heavy duty punch and shear	..	..	..	..	N	..	..	..	..	1	..	..	..	..	..	..	..
Horizontal boring mill	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..
Vertical boring mill	..	..	..	..	1	..	N	N	..	..	1	..	..	..	1	..	..
Wheel press	1	..	1	N	1	..	N	N	1	1	1	1	1	..	1	1	1
Pipe cut. and thread. mach.	..	..	..	N	1	..	..	N	1	1	..	..	..	..	..	..	..
Axle straightener	..	..	..	..	..	..	..	N	..	N	1	..	..	..	..	..	1
Bolt cutter	..	..	..	..	..	1	1	N	..	1	1	2	1	N	1	1	1
Key seat cutter	..	..	..	..	..	..	..	N	..	..	..	..	..	..	..	..	..
Woodworking Shop																	
Band saw	1	..	..	..	1	1	1	..	1	1	1	..	1	1	1	1	1
Universal table saw	..	..	..	..	1	N	1	..	..	..	..	..	N	..	1	1	1
Wood planer	..	..	..	..	1	1	1	..	..	1	1	..	N	1	1	1	1
Double spindle planer	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..
Wood lathe	..	..	..	..	1	..	1	..	..	1	..	..	..	..	1	1	..
Vertical mortiser	..	..	..	..	N	..	..	..	N	1	..	..	N	..	1	1	..
Horizontal mortiser	..	..	..	..	..	..	..	..	..	1	1	..	..	..	1	..	..
Rip and cut-off saws	..	..	1	..	..	1	..	..	1	1	1	..	..	1	2	1	..
Resaw	..	..	..	..	..	..	..	..	..	..	..	..	N	..	..	..	..
Shaper	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	1	..
Power sander	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..
Joiner	..	..	..	..	N	..	..	..	1	..	..	..	..	..	1	1	1
Sticker	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Tenoner	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Saw filer and setter	..	..	..	..	..	..	..	..	..	1	1	..	..	..	1	..	1
Molding machine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Glass cutting machine	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..

Note: N means additional tools needed to do maintenance work efficiently, as indicated by master mechanics.

Having known for a long time, but in a general way, that electric railway shops are very poorly equipped on the average, the JOURNAL undertook for this Annual Maintenance Number to derive a definite measure of how well or how poorly the shops actually are equipped. Information was gathered in from 62 properties in all parts of the country and of all sizes, the aim having been to include data from 25 companies in each of three classes: Class I, 5 to 50 cars; Class II, 100 to 300 cars, and Class III, 400 cars up. These data are summarized in the accompanying tables. With the actual data covering the 62 properties of all three classes as the basis, the total figures for the industry were roughly estimated.

The tables are self-explanatory so far as the data there are concerned. But it is by noting the blank spaces and the smallness of the figures opposite the items for some of the companies that one is able to discern to what extent the companies are equipped as to machine tools. The vertical columns show what the individual companies have and what they lack; the horizontal rows give a comparison among the several companies as to the extent of use of each type of machine tool equipment.

These first three tables do not take into account the suitability of the tools shown to be in use. A better idea of this is obtained by noting how long ago the present machines were manufactured. From the data collected from the 62 railways the date of manufacture is known for about 1,000 of the machines. Of these, but 14.2 per cent were purchased since 1920; 14 per cent are from 5 to 10 years old; 20.5 per cent are from 10 to 15 years old; 22.3 per cent are from 20 to 25 years old, and 18 per cent are more than 25 years old.

Some would claim that a machine tool that is more than 10 years old cannot be considered as of modern design. On that basis it might be said that more than two-thirds of the present machine tool equipment in electric railway shops could be replaced to the advantage of the railways.

The data collected also included a statement from the master mechanics as to tools that should be added to their present equipment in order that their maintenance work could be done efficiently. Thirty railways showed that they needed 191 new machine tools, as

Table II—Classification of Machine and Woodworking Tools in Twenty Electric Railway Shops Maintaining from 114 to 277 Passenger Cars

No. passenger cars	114	123	126	126	132	137	140	146	146	150	175	182	189	191	218	218	230	232	276	277
Machine Shop																				
Emery wheels	2	2	2	2	2	2	2	2	2	4	2	4	1	2	2	2	8	2	3	1
Grinding machine	..	..	..	..	..	..	..	..	..	1	1	1	..	..	1	..	..	..	1	..
Grindstone	1	..	1	1	..	1	..	1	1	..	2	..	..	1	..	..	3	1	..	1
Drill press	3	1	1	3	3	2	2	3	3	3	4	3	2	3	2	2	4	2	3	4
Radial drill	..	1	1	..	N	1	1	..	..	..	1	..	1	..	..	N	..	..	1	..
Wheel turning lathe	N	..	1	..	1	..	1	1	..	..	2	1	1	..	1	1	..	..	1	..
Heavy turret lathe	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	3	..
Hand screw machine	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Low swing axle lathe	..	..	..	1	1	..	..	1	..	2	1	1	..	..	N	..	1	..	..	..
Other lathes	2	2	2	2	4	4	3	3	2	1	4	2	3	7	3	3	2	3	5	2
Milling machine	N	..	1	..	N	..	..	..	N	..	..	1	..	..	..	N	1	..	2	..
Shaper	1	1	1	1	1	1	1	1	..	1	2	1	1	1	1	1	1	1	1	1
Power hack saw	1	..	1	1	2	1	N	2	1	1	2	1	1	1	1	1	1	2	1	1
Planer	..	..	..	..	..	1	..	1	..	1	1	..	..	..	..	1	1	..	1	..
Punch press	..	..	..	..	N	..	..	..	..	..	1	..	..	..	N	..	..	..	1	..
Heavy duty punch and shears	..	..	..	..	..	1	..	..	..	..	..	1	N	..	..	..	..	..	..	1
Horizontal boring mill	..	1	..	..	..	..	..	1	1	..	..	1	..	..	..	1	1	..	..	..
Vertical boring mill	1	..	1	1	1	1	1	..	..	1	2	2	1	1	1	..	..	1	2	1
Wheel press	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pipe cutting and threading machine	1	..	1	..	..	1	1	..	..	..	1	1	1	..	1	1	..	..	1	1
Axle straightener	1	..	N	..	1	..	..	..	..	1	1	1	..	1	..	..	1	..	..	1
Bolt cutter	1	1	1	N	1	..	..	..	1	..	1	1	..	1	1	..	..	1	1	1
Hydraulic press	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	1	1	..	..
Key seat cutter	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wheel grinder	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Bearing boring machine	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Woodworking Shop																				
Band saw	1	1	1	1	1	1	1	1	1	1	..	1	..	1	1	1	1	1	1	1
Universal table saw	1	..	1	1	1	..	..	..	..	..	..	1	..	..	1	..	..	..	..	1
Wood planer	..	..	1	1	1	..	N	1	1	1	..	1	..	1	1	1	1	1	..	1
Double spindle planer	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Wood lathe	..	1	1	1	1	1	1	1	1	..	..	1	..	..	1	1	..	..	..	1
Vertical mortiser	1	..	1	..	1	1	..	..	1	..	..	1	..	..	1	1	1	1	..	..
Horizontal mortiser	..	..	1	1	..	..	N	1	..	..	..	..	..	..	1	..	..	..	..	..
Swing saw	..	..	..	..	..	..	N	1	..	..	..	1	..	..	1	..	1	..	..	..
Rip and cut-off saws	..	1	1	1	..	1	1	1	1	1	..	..	..	1	1	1	1	1	1	2
Resaw	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Shaper	..	..	1	1	..	..	N	..	N	..	..	1	..	..	1	1	1	1	..	1
Power sander	..	..	..	1	..	..	N	..	1	..	..	2	..	..	1	..	2	..	..	2
Joiner	..	..	..	1	1	1	N	..	1	..	..	1	..	..	1	1	..	1	..	..
Sticker	..	1	..	..	..	..	N	..	..	..	..	..	..	..	1	..	..	..	..	..
Tenoner	..	..	1	1	..	..	..	..	..	..	..	1	..	1	1	..	..	..	..	1
Saw gummer	N	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Saw filer and setter	N	..	..	1	1	..	1	..	..	..	..	1	..	..	..	..	1	..	..	..
Universal wood worker	..	..	..	1	..	..	1	..	..	..	..	..	1	..	1	..	1	..	..	..
Molding machine	..	..	1	1	..	..	..	..	..	..	..	..	..	..	1	N	..	..	..	1
Post borer	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	N	..	..	..	..

Note: N means additional tools needed to do maintenance work efficiently, as indicated by master mechanics.

Table III—Classification of Machine and Woodworking Tools in Nineteen Electric Railway Shops Maintaining 400 Passenger Cars and Up

Number of passenger cars	400	407	409	410	416	438	445	500	600	629	653	738	755	807	1,030	1,398	1,466	1,500	2,343
Machine Shop																			
Emery wheels	5	2	3	3	2	1	4	4	6	1	2	5	5	2	7	10	1	9	2
Surface grinder	..	..	..	..	..	N	..	..	..	..	..	3	..	1	4	..	..	..	1
Grinding machine	1	2	1	..	1	..	N	1	3	..	1	2	3	2	3	5	3	4	1
Grindstone	..	1	1	1	2	1	..	..	..	..	..	1	..	1	..	2	1	1	2
Drill press	4	3	4	3	6	3	5	6	11	4	1	16	8	4	14	17	3	10	8
Radial drill	2	1	..	1	3	N	1	2	1	..	..	2	1	1	3	..	..	1	2
Wheel turning lathe	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	..	1	1	1
Heavy turret lathe	..	..	..	..	..	..	..	..	3	..	1	4	1	2	8	..	..	1	1
Hand screw machine	..	..	..	..	..	..	..	..	..	..	..	1	2	..	1	1	..	..	..
Low swing axle lathe	..	N	..	..	1	..	..	..	1	1	1	2	..	1	2	1	..	1	1
Other lathes	6	4	5	3	10	4	4	5	3	3	1	7	8	4	11	21	6	5	8
Milling machine	2	N	..	..	..	N	1	..	1	1	1	4	2	1	7	4	..	2	3
Shaper	2	1	1	1	2	2	2	2	2	2	1	5	3	1	1	3	1	2	2
Power hack saw	..	1	2	1	..	1	1	3	1	1	1	5	2	2	2	1	2	1	1
Planer	1	1	1	1	2	1	1	3	3	..	1	3	3	1	5	4	1	1	1
Punch press	1	..	1	..	..	..	1	1	1	..	..	2	N	2	1	4	..	1	1
Heavy-duty punch and shears	..	..	..	..	1	..	..	..	..	..	..	2	..	1	..	..	..	1	1
Horizontal boring mill	1	1	..	..	..	..	..	..	..	1	..	..	1	1	2	1	..	1	2
Vertical boring mill	1	1	1	1	1	N	1	1	1	1	2	2	2	2	3	3	1	2	3
Wheel press	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2
Pipe cutting and threading machine	..	1	1	1	2	..	1	..	..	1	1	2	1	1	3	..	..	1	1
Axle straightener	1	1	..	1	1	1	1	1	..	..	..	1	1	1	1	1	1	..	2
Bolt cutter	1	1	..	1	2	1	..	2	1	..	..	3	..	2	2	3	1	1	1
Broaching press	1	N	..	..	..	N	..	..	..	..	..	..	..	..	2	1	..	..	1
Key seat cutter	..	N	..	..	..	..	..	..	..	..	..	1	1	..	1	1	..	1	..
Wheel grinder	..	..	..	..	..	..	1	1	..	..	..	..	1	1	..	2	..	..	..
Metal cutting saw	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	1
Hydraulic press	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..
Gear cutters	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..
Tapping machine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..
Woodworking Shop																			
Band saw	2	1	1	1	3	1	2	2	3	1	1	3	2	2	2	4	2	2	2
Universal table saw	..	1	..	1	1	N	1	..	1	1	..	1	1	2	1	1	1	3	1
Wood planer	1	1	1	2	1	..	1	1	2	1	1	3	1	3	2	2	..	..	1
Double spindle planer	..	..	..	1	1	1	..	..	..	..	..	..	1	1	..	2	..	1	1
Wood lathe	2	1	1	1	1	1	1	1	1	..	1	3	2	1	2	2	3	1	1
Vertical mortiser	2	..	..	1	1	1	1	2	1	1	1	1	1	1	..	2	1	1	2
Horizontal mortiser	..	1	1	1	1	..	..	..	1	..	..	1	1	1	2	2	..	..	2
Jig saw	1	..	1	1	..	..	..	..	..	..	..	1	1	1	..	1	..	..	1
Swing saw	1	1	..	1	..	N	1	1	1	..	1	1	1	2	1	1	1	1	1
Rip and cut-off saws	1	1	2	1	3	1	N	2	..	..	..	2	3	3	5	5	..	..	3
Resaw	..	1	..	1	..	..	..	..	..	..	1	..	..	1	1	1	..	..	..
Shaper	1	1	2	1	1	N	1	1	1	1	1	1	1	1	1	5	1	1	2
Power sander	1	1	..	1	2	..	N	1	1	..	1	4	3	1	2	1	1	2	1
Joiner	1	1	1	1	2	2	1	1	2	1	..	2	2	1	4	2	1	1	2
Sticker	1	1	1	1	3	N	..	1	1	1	1	2	..	3	1	3	..	..	2
Tenoner	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	3
Saw gummer	..	..	..	1	3	..	..	..	..	..	..	1	1	1	..	1	..	..	..
Saw filer and setter	..	..	1	1	2	1	..	1	..	..	..	1	1	2	..	4	..	1	1
Universal wood worker	..	..	1	1	..	1	..	..	1	..	1	3	1	2	1	3	..	..	..
Power groover	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	2	..	1	..
Molding machine	..	1	..	1	..	..	..	1	2	1	..	2	1	..	1	1	1	1	1
Dovetail machine	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	1	..
Knife grinder	..	1	..	1	..	..	..	..	..	..	..	..	2	..	1	..	..	..	..
Post borer	..	..	1	..	1	..	1	1	..	..	..	1	1	..	..	..	..	3	1

Note: N means additional tools needed to do maintenance work efficiently, as indicated by master mechanics.

listed in Table IV. The other 32 railways included in the study did not indicate the need of any additional tools. Assuming then that 191 is the total of additional machine tools needed by the 62 railways, it is estimated on this basis that the entire industry, if canvassed, would indicate its need for 2,500 additional new machine tools.

The 62 companies show a total of 1,893 machine tools of all types in their present shop equipment. This would indicate a total of approximately 25,000 machine tools in use in the electric railway field.

Of the total of 191 new machines shown to be needed by 30 companies 83 were for the machine shop, 55 for the carpenter shops, 23 for the forge shop, 15 for the armature room and 15 for the sheet metal shops. In the machine shops, particular need was expressed for additional surface grinders, wheel-turning lathes and other lathes, milling machines, axle straighteners and bolt cutters. In the woodworking shops the greatest need appears to be for universal table saws, wood shapers and power sanders. In the forge shops, bulldozers and shears are needed most. Armature rooms need banding lathes and the sheet metal shops need additional power shears.

Table IV—Additional Tools Needed by 30 Electric Railways to Carry On Maintenance Work More Efficiently

Machine Shop	
Emery Wheels	2
Surface Grinder	6
Grinding Machine	2
Grindstone	1
Drill Press	2
Radial Drill	4
Wheel Turning Lathe	7
Heavy Turret Lathe	2
Low Swing Axle Lathe	4
Other Lathes	5
Milling Machine	6
Shaper	2
Power Hack Saw	3
Planer	2
Punch Press	2
Punch and Shears	4
Vertical Boring Mill	4
Wheel Press	4
Pipe Cut. and Thread. Mach.	3
Axle Straightener	5
Bolt Cutter	5
Broaching Press	3
Key Seat Cutter	2
Air Hoist	1
Electric Welder	1
Babbitt Furnace	1
Total	83
Woodworking Shop	
Band Saw	1
Universal Table Saw	6
Wood Planer	4
Double Spindle Planer	2
Wood Lathe	1
Vertical Mortiser	4
Horizontal Mortiser	2
Jig Saw	1
Swing Saw	3
Rip Saw	3
Shaper	5
Power Sander	6
Joiner	2
Sticker	4
Tenoner	2
Saw Gummer	3
Saw Filer and Setter	3
Molding Machine	1
Boring Machine	1
Tool Grinder	1
Total	55
Forge Shop	
Forging Machine	1
Bulldozer	6
Steam Hammer	3
Air Hammer	3
Drop Forge Hammer	3
Punch and Shears	6
Belt Driven Hammer	1
Total	23
Armature Room	
Commutator Grooving Machine	2
Banding Lathe	6
Coil Winding Machines	2
Coil Presses	1
Commutator Lathe	1
Hydraulic Press	3
Total	15
Sheet Metal Shop	
Circle Cutter	2
Turning Machine	1
Setting Down Machine	1
Foot Power Shears	5
Foot Power Punch	1
Foot or Hand Break	2
Scroll Shears	1
Riveting Machine	2
Total	15

A by-product of Tables I, II and III is that they enable one to see just about what machines ought to be included in the equipment of electric railway shops of various sizes.

Big Track Job Quickly Done

THE rapidity with which trackwork can be done when a full equipment of plows, concrete breakers, etc., is used was shown by a job done by the Cleveland Railway. This job consisted in taking out and relaying 669 ft. of double track on East Ninth Street, between Euclid Avenue and Prospect Avenue, S.E. Approximately thirty-four and one-half working hours were consumed. Two shifts of sixty men each began work at 9 o'clock on a Saturday evening, and worked constantly until 5 o'clock on the following Monday morning when the first car operated over the new rail.

After taking up the pavement and removing the old tracks, a new double track, using 102-lb. rail, was laid, riveted and welded, and 4 in. of concrete poured over the International steel ties. During the progress of this work vehicular traffic, bound north and south at Cleveland's busiest corner, was not interrupted.

Acid in Lubricating Oil Advocated to Reduce Friction

THAT the addition of small quantities of organic acids to mineral lubricating oil reduces the friction in bearings was asserted by Dr. T. E. Stanton, director of the National Physical Laboratory, England, in a lecture before the last meeting of the International Air Congress in London. He took issue with the Reynolds theory of lubrication, which assumes that the value of oils as lubricants depends solely on their viscosity, and that the nature and composition of the rubbing surfaces have nothing to do with the efficiency of the bearing.

"Up to comparatively recently," said Dr. Stanton, "it has been common to state that the Reynolds theory is not concerned with the manner in which the film of oil is formed, but only with the conditions which exist when it is formed, and that it may well happen that when starting up machines from rest when the bearing surfaces are in contact, certain special characteristics of lubricants on bearing surfaces may be essential not only to prevent excessive wear; but to insure conditions favorable to the formation of a separating film.

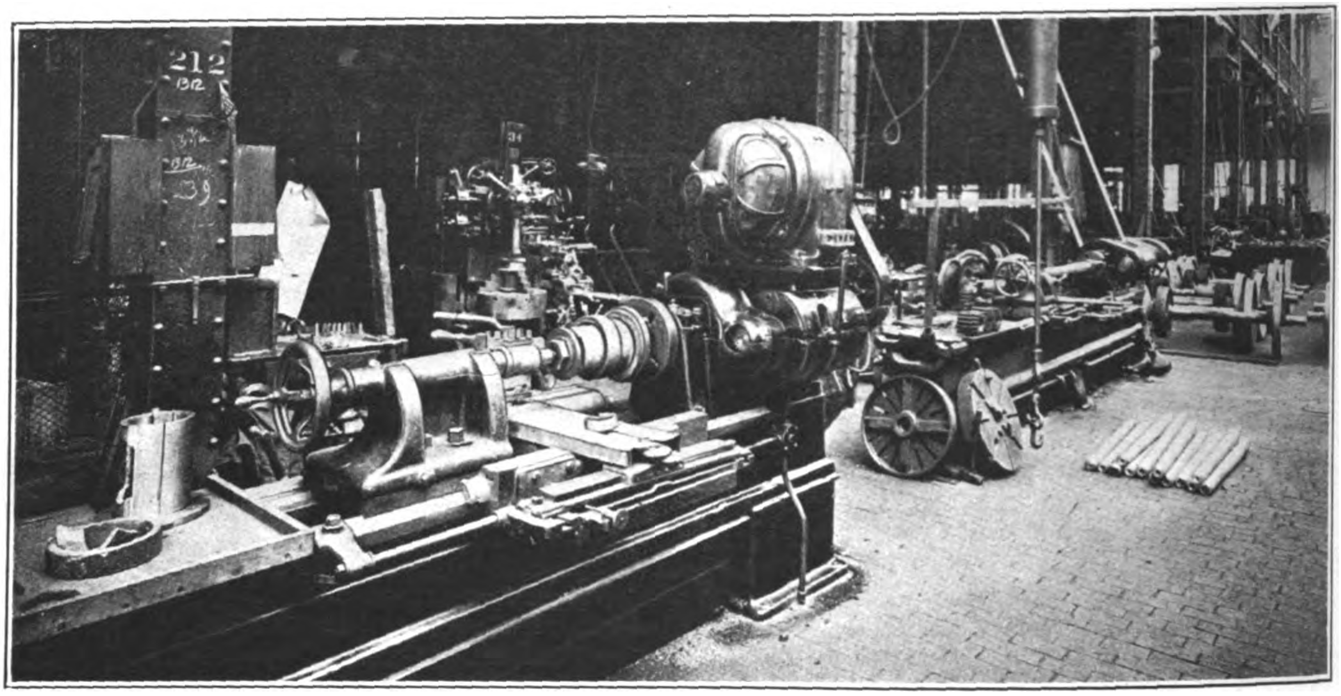
"Gradually, however, it has become more and more certain that there can exist between rubbing surfaces a condition of steady lubrication whose characteristics are totally different from those to be expected from the application of the Reynolds theory. It is now recognized that solid surfaces having an adsorbed layer of lubricant of only one molecule in thickness can slide over each other with comparatively small frictional resistance. Further, it is known that adsorption is dependent upon the chemical constitution of the lubricant and that the greater the work done in the process of adsorption the less the frictional resistance on the surface to sliding. Acids, alcohol, and esters are more strongly adsorbed by water than are paraffins, and it is found that the former are the better lubricants."

Dr. Stanton then described a series of tests made on various types of bearings and gears, which indicated a marked superiority of the animal and vegetable oils over the mineral oils as regards the temperature at which the gears could be run without a serious increase in the friction. Tests were made with various kinds of animal, vegetable and mineral oils, including a petroleum product known as "Bayonne oil." The following observation was made:

"The effect was then tried of adding small percentages of organic acid to the Bayonne oil in order to find out whether any reduction of friction took place corresponding to that obtained in the worm-gear test previously carried out by the Lubricant and Lubrication Inquiry Committee. It was found that a 17 per cent reduction in the coefficient of friction was obtained by the addition of as little as 1 per cent of organic acid to the Bayonne oil, and that increasing the amount up to 5 per cent did not effect any further improvement."

How Modern Machine Tools Cut Costs

Multiple-Cut, Low-Swing Lathes Reduce Time for Machining Axles to One-Quarter of that Required with Older Type Machines—Finishing Axle Surfaces by Grinding Reduces Time by 25 per Cent—New Type Boring Mill Turns Out Twice as Many Wheels per Day as the Average in Most Shops



Three Tools Used in Machining Bearings and Axles in Vincennes Shops of Chicago Surface Lines

IN A special search for new and particularly effective methods of applying modern machine tools to the maintenance work in electric railway shops, the editors of the JOURNAL have visited some fifty properties and have found a few examples that are described here. These have been selected from the practices found in the fifty shops because they showed a real effort to apply modern machine tools and methods to electric railway work. Some of the practices given show the application of new machine tools, while others describe new uses of old machine tools.

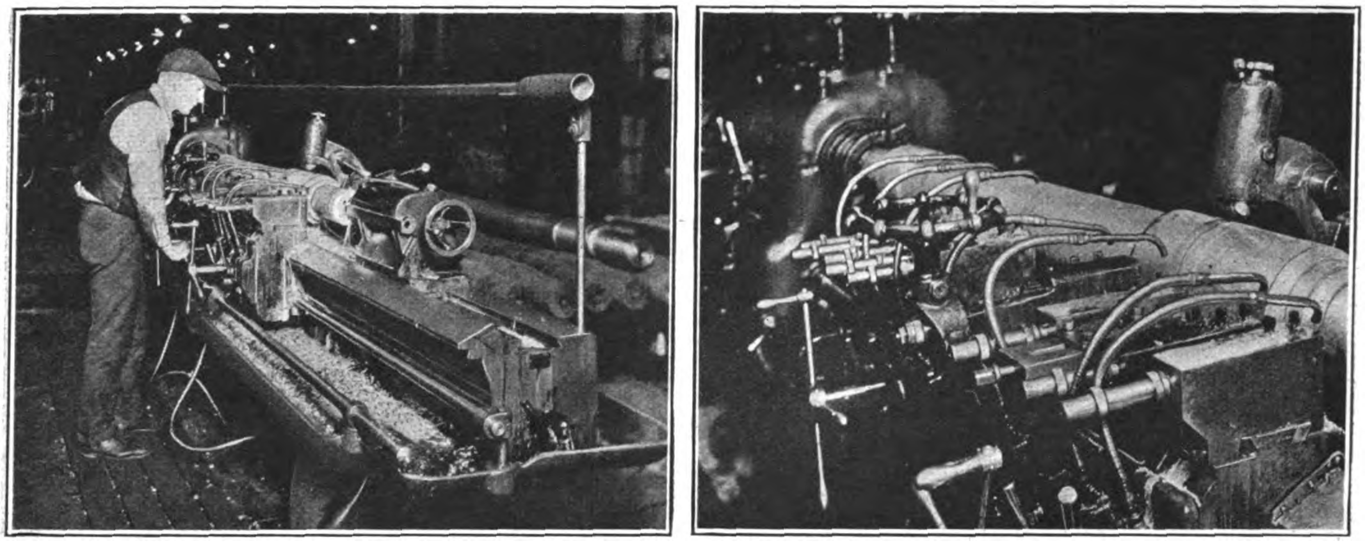
The use of modern machine tools has a direct bearing on the cost of labor and produces a further saving by reducing the time that cars must be held in the shop for repairs. There are certain classes of maintenance work that must be handled continually, and as a result the same kind of machine work is done repeatedly. In such cases the volume of this work may be sufficient so that a modern machine tool, particularly adapted for this single class of work, will prove a paying investment and make it possible to apply manufacturing methods to maintenance work with gratifying economies and production of better work.

The real function of an electric railway shop is to get the equipment back into service after repairs in the shortest space of time and with the lowest possible cost. The variety of work handled is necessarily very great, and it is not always practical to have the best machine with which to do each class of work. In talking with various shop foremen and master mechanics, however, the editors have been impressed with the fact that they are quite awake to the losses their companies are suffering because of the continued use of old machine tools, when new tools with far greater production capacity are available. The cost of new tools is quite an item, however, and many managements have not been willing to put any additional investment into the shop. Now, with widely improving financial conditions among the railways, more interest in shop economies through purchase of new machines is beginning to be evidenced.

By considering the various kinds and quantities of work done in maintaining electric equipment, such as the turning of wheels, machining of axles, finishing of bearings and building up and remachining of motor shell fits, one finds jobs that are done repeatedly, and in considerable quantities, by all railway shops. On the larger electric railway systems the quantity of each of these various classes of work is sufficient to keep certain machine tools in continuous operation on one class of work. These shops can therefore afford to have a machine particularly adapted for the individual work to be performed.

HOW MULTIPLE CUTTING LATHES REDUCE COST OF AXLE MACHINING

The amount of axle work done by various roads is considerable. In shops of the larger systems several lathes are kept busy continuously turning axles, and in most of the smaller shops this machine work constitutes a considerable proportion of the lathe work. Most railways purchase their axles from rough stock and finish them to the required dimensions. In addition, of course, there is considerable machine work required in refin-

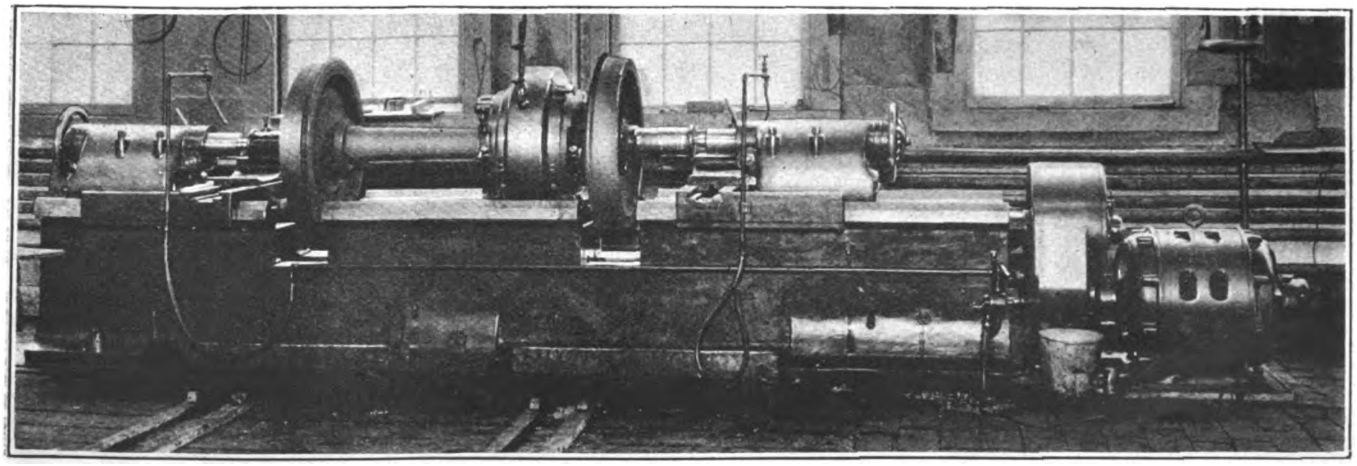


Machining a Large Subway Axle in a Lathe with Two Carriages and Six Tool Posts at One of the Shops of the Brooklyn-Manhattan Transit Corporation. The Illustration at the Right Shows Arrangement of Tools so that Six Surfaces on the Axle Are Finished at the Same Time

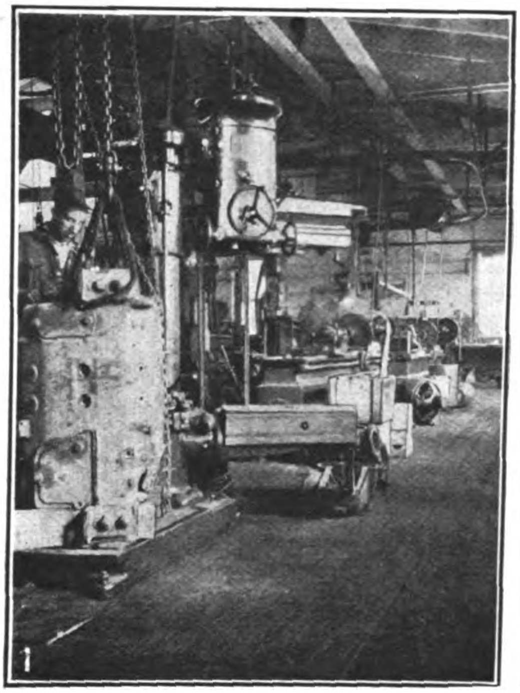
ishing worn axles. Axles for electric railway service have several shoulders and machined fits of various diameters, the finished part usually consisting of two journal fits, two machined surfaces for dust collars, two wheel fits, one gear fit and two axle bearing fits. In addition it is frequently necessary to rough turn the center part of the axle. There are thus nine finished fits of varying diameters and lengths. Where the amount of axle work is great enough a particular machine can be set aside for doing this. A lathe with 8-in. swing is sufficient since the finished diameters of axles are rarely more than 7 in.

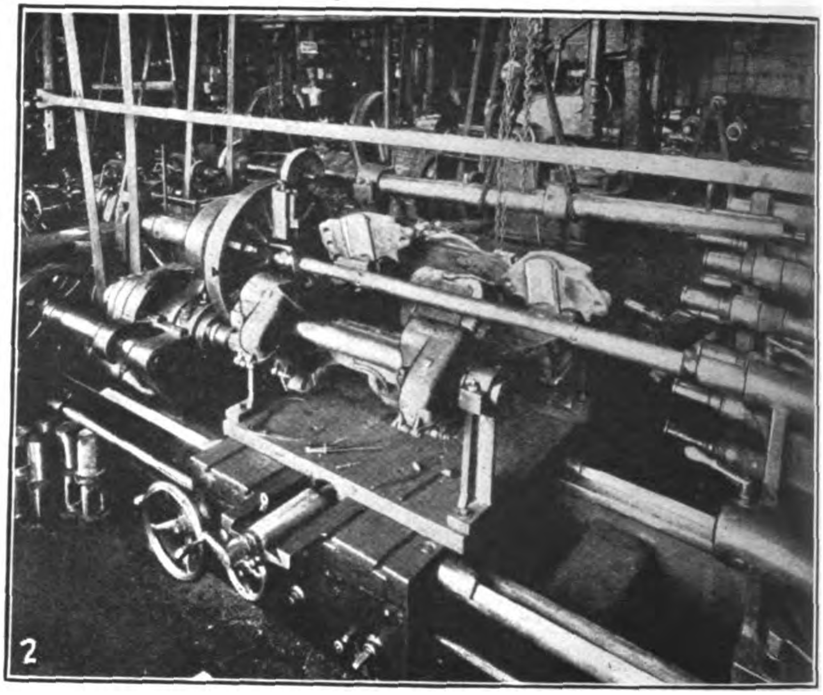
The Brooklyn-Manhattan Transit Corporation, which maintains nearly 6,000 elevated, subway and surface cars in Brooklyn, New York, has recently purchased two Lo-Swing lathes from the Fitchburg Machine Works to be used exclusively for axle work. These lathes have an 8-in. swing and 108-in. length of bed. They are provided with two carriages with three tool posts on each, so that six tools can be used for cutting on the same piece at the same time. As a result of the use of this rapid production lathe, the time necessary to finish axles has been reduced to one-fourth of what it was originally, where ordinary low-swing engine lathes were used. An accompanying illustration shows one of these lathes in operation while turning a large subway car axle. The various finished fits for this type of axle are journals 5 x 9 in., dust guard surfaces $6\frac{1}{8}$ in. x 2 in., wheel fits $7\frac{7}{16}$ in. x $6\frac{1}{2}$ in., gear seats $7\frac{1}{2}$ in. x $6\frac{1}{8}$ in. and axle bearings $6\frac{1}{2}$ in. x $12\frac{3}{4}$ in. The total length of the axle is 7 ft. 1 in. The illustrations show this machine in operation just as the rough cuts at one end of the axle are being finished.

With the improved lathe equipment this size axle is now being turned for file finish and rolling of bearing fits in an average of two and one-half hours. With the lathes previously used the machining of this size axle required three hours for rough finishing and an additional nine hours for finishing cuts. In addition to provision for multiple-tools cutting simultaneously this type of lathe has a geared headstock, providing for six spindle speeds, and a geared feed with nine changes. The geared headstock is of rugged design, so as to withstand the severe strain imposed upon it when several tools are taking heavy cuts simultaneously. The clutch for starting and stopping the machine is on the driving pulley shaft and is operated by the shifter rod placed above the table. In order to give a rigid support to the tool holders, these are clamped directly to the carriage casting itself, which in turn bears directly on the bed of the lathe. This eliminates numerous intervening parts in the supports for the cutting tools



with Wheels Mounted Lathe with Two Carriages and Machined Gaps in the Bed, Turning Journals of Axles



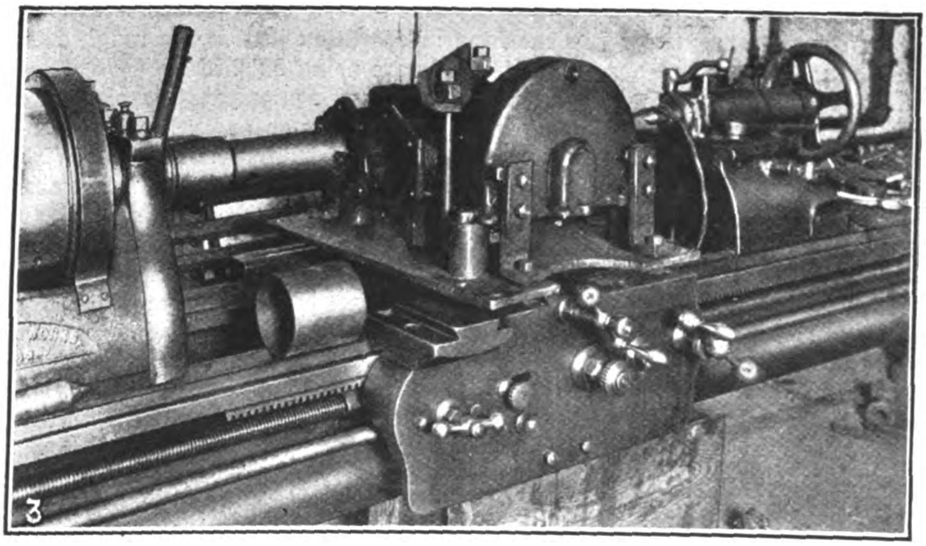


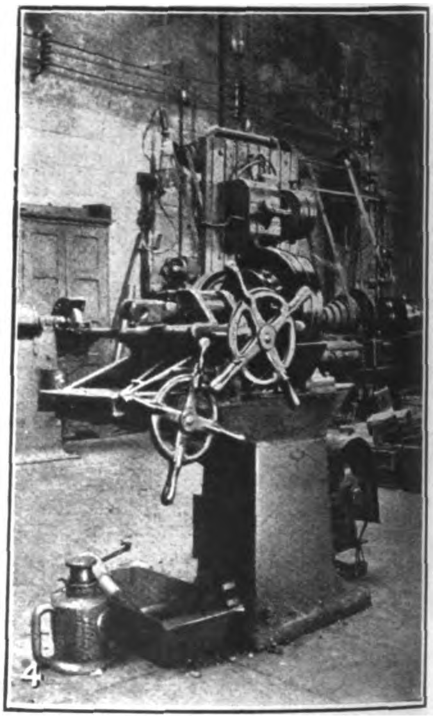
No. 1. Boring out a motor shell in the shops of the Washington Railway & Electric Company by use of a radial drill.

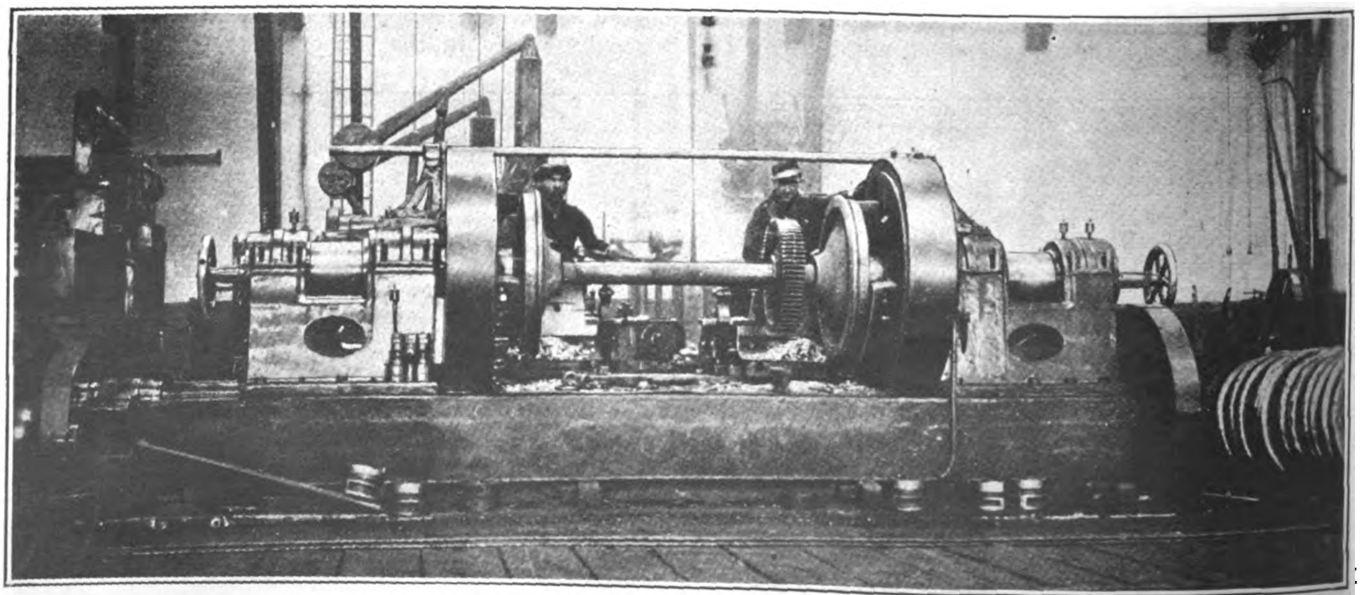
No. 2. Double-spindle lathe used for boring out motor shells at Spokane, Wash.

No. 3. Reboring compressor cylinders with boring bar attachment to lathe.

No. 4. A combination bolt and pipe threading machine is a great time saver in electric railway shops.





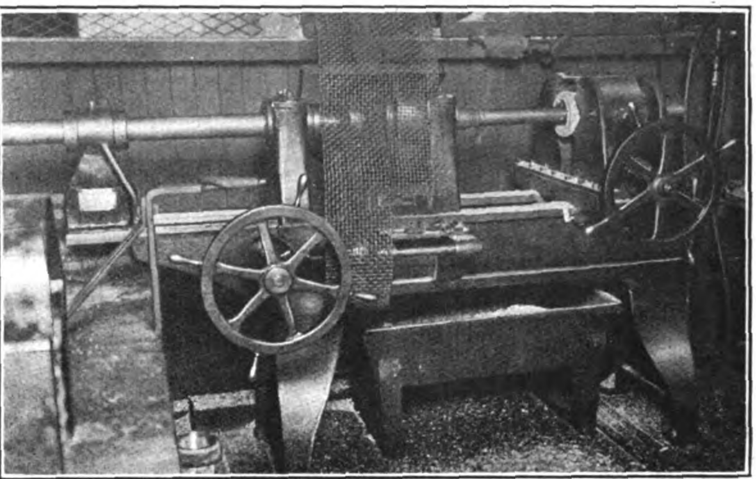


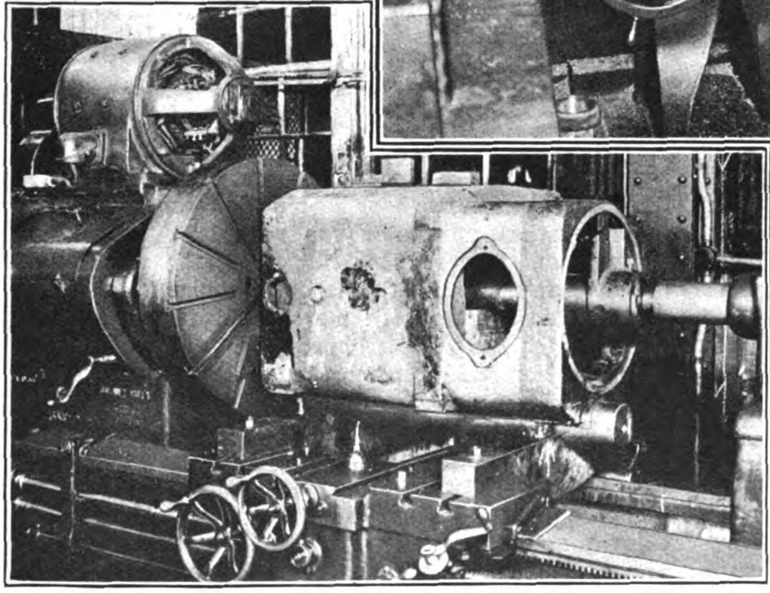
Modern Type of Niles Wheel Lathe in the Shops of the United Railways & Electric Company, Baltimore and avoids possibilities for vibration. The cutting tools do not extend across the bed of the lathe. This permits the carriage to be run past the tailstock, or back rest, without moving the tools from their positions. A geared pump is built into the head of the lathe for providing a continuous flow of cutting compound.

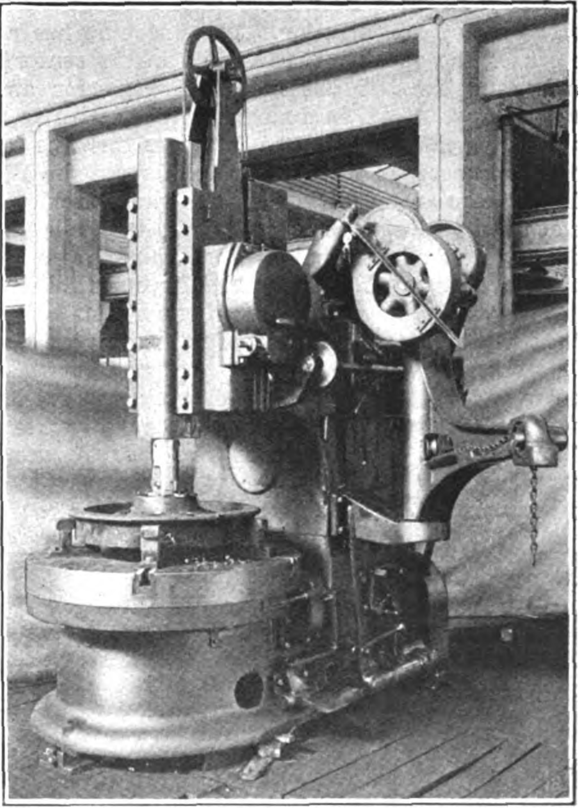
A modern multiple-cut, low-swing lathe is also used in the West Shops of the Chicago Surface Lines for machining armature shafts. This machine takes six simultaneous cuts on different sized shoulders and compared with the single tool method commonly used has almost three times the output.

After the machine work on axles is done in a lathe it is the usual practice in electric railway shops to file finish, burnish with rollers or to grind the finished surfaces of the various fits. An accurate smooth surface is most essential for this work, since if the bearing surfaces are rough the linings of bearings are ground out quickly and additional maintenance repairs to the bearings are soon needed. Various methods for file finishing and burnishing with rollers have been described frequently in the columns of this paper. Surface grinding for finishing the bearing faces is coming into more extensive use. An accompanying illustration shows an armature shaft being finished by grinding in the shop of the Chicago Surface Lines. The grinding machine used in this case saves 25 per cent of the time that was taken previously when axles were finished in a lathe. It is also claimed that there is greater accuracy of dimensions and smoothness of finish so that longer life of bearings results. Where wheels or gears are to be pressed on axles the grinding finish produces more uniform pressure for pressing on and a better fit on the shaft, as irregularities are eliminated. In the Chicago shop the entire shaft is finished on a grinder.

A few roads which have used the grinding methods called particular attention to the necessity of removing all emery from the surface, since if emery particles are left on the bearing faces there is a tendency for this to grind out the bearings themselves and so reduce their life. As the pressure employed, however, is not great, there is very little danger of the particles of emery becoming imbedded in the surface of the axle. The maintenance of journals requires returning bearing fits due to their becoming scored, cut or excessively worn, and unless the wheels are worn out so that their removal and replacement is necessary, it is often more convenient and economical to turn the journals with the wheels mounted on the axle. This method greatly increases the production as compared to that obtained when the wheels are pressed off the axle, the journals re-turned in an axle lathe, and the wheels again pressed on. There is also the difficulty and loss of time in this latter method of having to match the wheels and axles; also, when once the original tight fit between the wheels and axles is destroyed, a lower





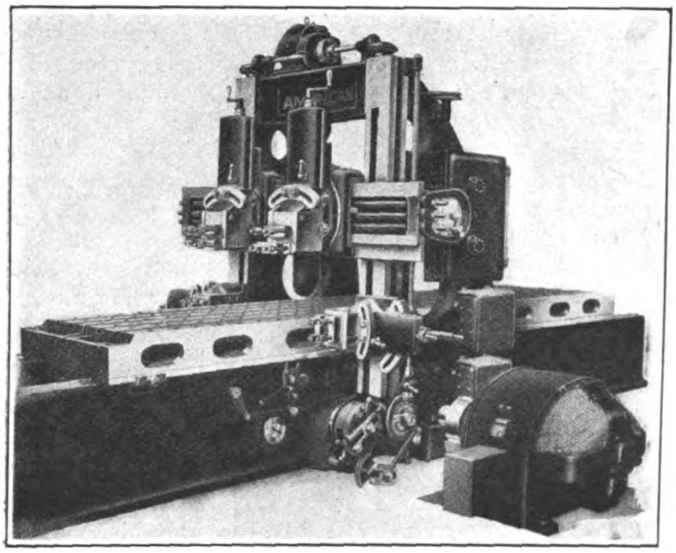


Three Rapid Production Machine Tools that Obtain Marked Economies

Top—Universal jaw-type chuck used on machines for boring bearings in the Eastern Division shops of the Brooklyn-Manhattan Transit Corporation.

Left—Machining the armature housing fit in a motor shell in the Chicago Rapid Transit Company's shops.

Right—Car wheel borer with capacity of from ten to fifteen wheels per hour.



Multiple Tool Planer Suitable for Electric Railway Machine Shop Operation

pressure will force the wheels in position with newly machined axles and wheels, and the fit will be looser.

For this class of work several railways are considering the use of a combination journal truing and axle lathe, as manufactured by the Consolidated Machine Tool Corporation, Rochester, N. Y., and shown in an accompanying illustration. This machine has a headstock of the opening type located in the center of the lathe and the bed has machined gaps for swinging wheels up to 45 in. in diameter. When used as a journal truing machine the two carriages turn the journals at the same time with the wheels mounted. Finished filler blocks are furnished which, when inserted in the machined gap, give the carriage full travel between the driving head and the end of the machine, so that regular axle turning can be taken care of economically.

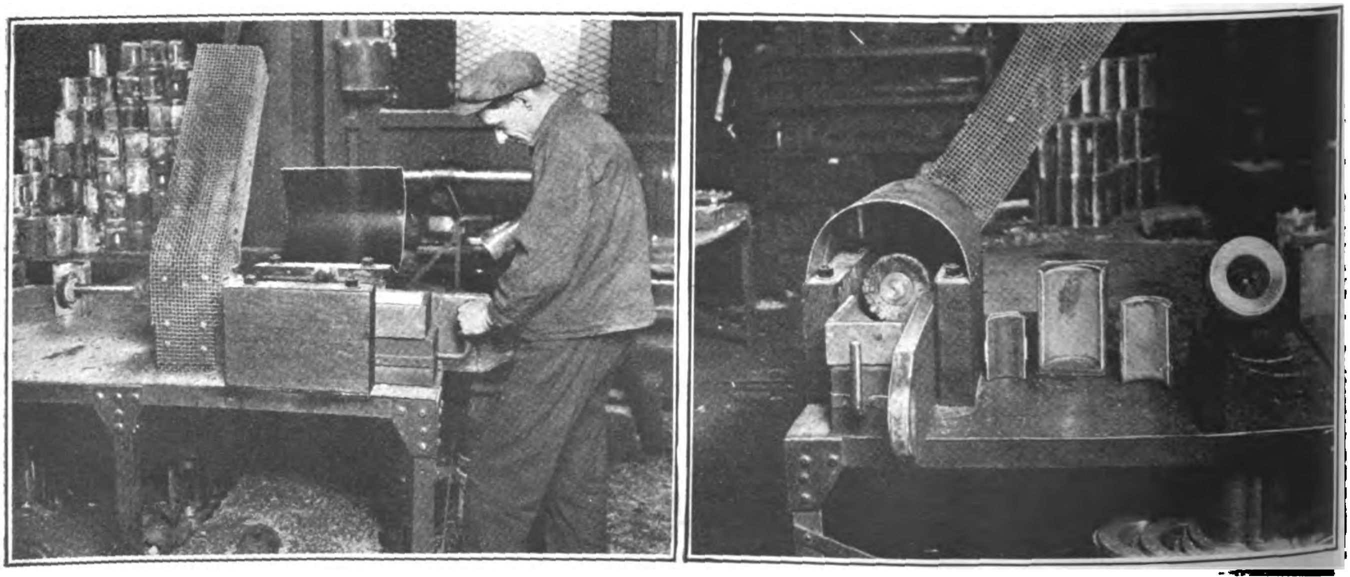
These lathes have a 27-in. swing over the bed, so that they will accommodate an axle with the gear mounted. In work which requires the re-truing of journals some users of this type of lathe are obtaining an average production of two sets of axles per hour; i.e., re-truing four journals. This, of course, exceeds the production that can be obtained where it is necessary to press wheels off and on again in order to turn the journals.

In the survey of machine tool equipment which has been made a considerable number of double-spindle lathes were found in use in electric railway shops. These double-purpose machines provide swings of either 24 in. or 48 in. in most cases. It is possible by using the high spindle to turn journal bearings in this type of lathe with the wheels and gears mounted. Some of the smaller railways which do not possess a wheel-turning lathe are using the two-spindle type for turning their wheels. While using the high spindle, but one wheel can be turned at a time and the cutting speed is quite slow, so that the average production is usually not more than two pairs of wheels per day. The changing from one spindle to the other takes considerable time, too, and entails a considerable amount of labor, so that most foremen do not favor the use of a double-purpose lathe where it is possible to purchase two single-purpose tools.

IMPROVEMENTS IN WHEEL LATHES AND BORING MILLS

The machine tool equipment required for wheel work was quite thoroughly treated in a series of articles on "Wheel, Gear and Axle Practice" which was published in the issues of this paper for Aug. 18, Oct. 27 and Nov. 17, 1923. Properties having steel wheels require an efficient wheel-turning lathe. The size of this is determined, of course, primarily by the size of the wheels which it is necessary to turn; probably either the 36-in. or the 42-in. size are in most general use. Several improvements have been made recently in wheel-turning lathes, particularly in regard to the shifting arrangement to save time in getting the wheels into position and also in the lathe equipment to permit taking heavier cuts with more rapid feed than with the old machines. These improvements of course speed up production and are of particular advantage.

A wheel press is necessary in almost every shop, and where steel wheels are used most properties favor a size of at least 400 tons capacity. At present a majority of the railways are using smaller presses, particularly the 300-ton size. But many have found difficulty in starting wheels when pressing off, and also in pressing off gears. Thus, with the smaller sizes of presses it is necessary to heat the wheels in order to start them, while with the 400-ton size a large number of these will start without the necessity of heating.



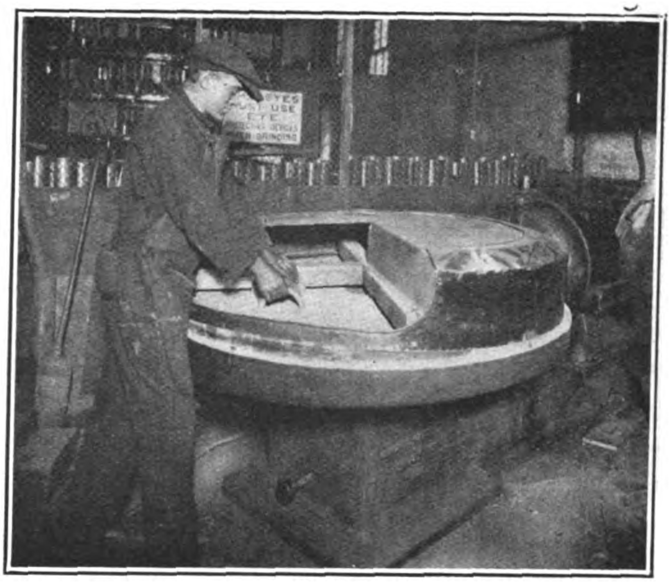
Left—Removing Excess Babbitt from Bearings with Circular Wire Brushes. Right—End View of Machine Shows the Brush and the Wedge Inserted to Remove Babbitt from Edge of Bearing

This of course saves considerable time and reduces the cost of the work considerably.

A boring mill is another piece of equipment which is necessary for wheel and gear work. The 36-in. or 42-in. sizes are most commonly used by electric railways. Modern boring mills have several new features that have been introduced within the past two or three years. One type just being introduced by the Consolidated Machine Tool Corporation of Rochester, N. Y., has an automatic chuck and independent power-driven rapid traverse to both the boring and facing spindles. This reduces the amount of labor and time required. The automatic chuck is controlled by a reversing friction clutch, so that it is unnecessary to stop or reverse the motor when closing or opening the chuck. When the driving clutch is thrown in, the table starts to rotate and the jaws move toward the center, gripping the wheel with the full driving force of the motor, and the heavier the cut the tighter the jaws will grip. When the bore is finished the table is stopped by means of a band brake operated by a foot pedal and the clutch is then thrown to the reverse direction, causing the jaws to open. This band brake also serves for stopping the table and allowing the operator to caliper the bore of the wheel, without loosening the grip of the jaws.

Six feeds are provided, which are obtained through selective, sliding gears. These may be changed while the machine is running. When the roughing cutter has passed through the wheel the operator can throw the proper speed lever so as to throw in the finishing speed without stopping the lathe. Two-in-one boring tools can be used with advantage. This machine is also made with a horizontal tool head for facing off the hubs of wheels, where this is required. Users of this machine are boring from ten to fifteen wheels an hour, which is extremely rapid production and twice the average obtained by most electric railway shops.

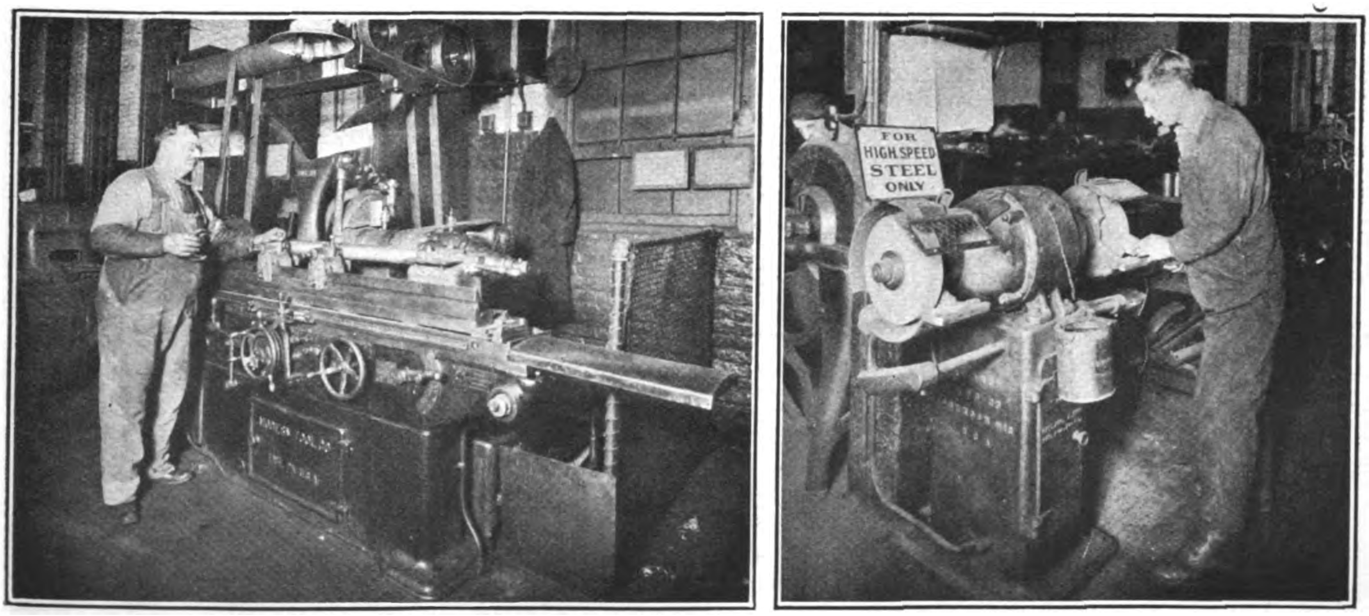
Another machine tool used to advantage in wheel and axle work is an axle straightener. Many railways are using some of their ordinary lathes with a special rigging for straightening axles, but in general much time is lost through the use of such devices, and the work is not done as satisfactorily nor efficiently as having a proper machine adapted to axle straightening.



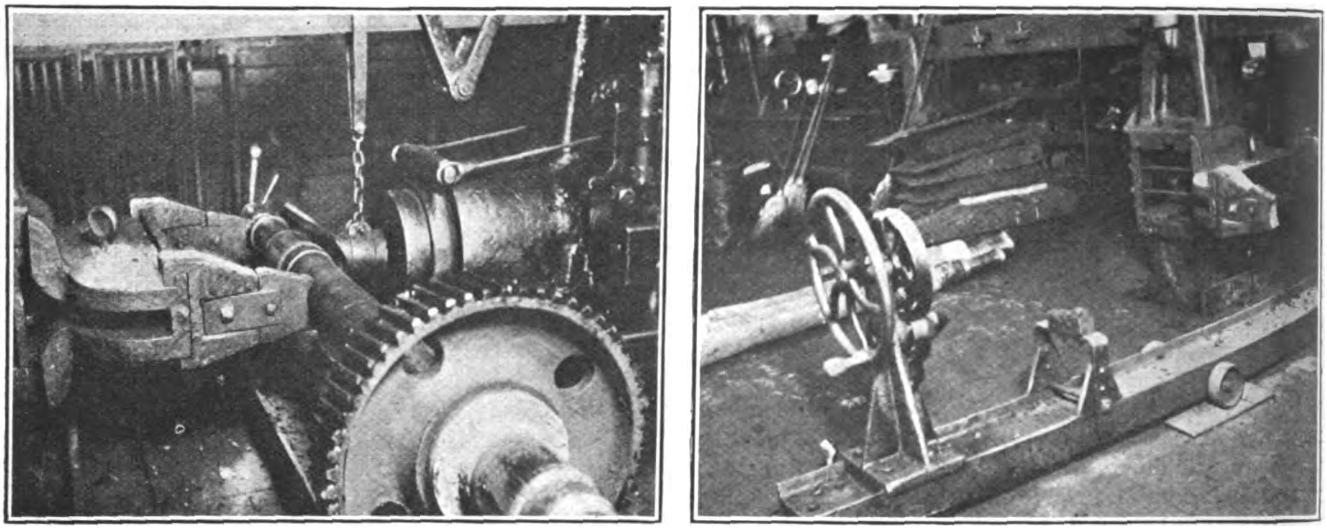
Finishing Axle Bearing Shells by Use of a Surface Grinder Multiplies Production by Four

Axles are straightened on a small wheel press in the shops of the Cleveland Railways. A fixture for holding the axle between centers is mounted on rollers so it can be moved transversely across the bed of the wheel press. The base of the fixture is a 12-in. I-beam. Upon this are mounted head and tail stocks, each equipped with a center. The head stock contains a hand wheel which drives a dog through a train of gears. This is used to revolve the axle and determine the position of the bend. Attachments to the head and tail stocks of the wheel press apply the pressure to the axle at the proper points for straightening. The advantage of this application lies in the large amount of power available from the 200-ton press.

The use of keys in connection with wheel and gear work is decreasing, but many railways have shops provided with key seaters. Where the work requires such a machine it should be arranged to cut key ways up to 1 in. in size, and preferably should be a single-purpose machine. On roads with few cars it is pos-



Left—Armature Shafts Are Finished in a Grinding Machine with a Saving of 25 per Cent in Time and (Right) Emery Wheels Are Set Aside for Tool Grinding in the Shops of the Chicago Surface Lines



Left—Straightening an Axle on a 200-Ton Wheel Press at Harvard Shops, Cleveland. Right—The Fixture Used for Holding the Axle Between Centers While Being Straightened

sible to use a slotter for this class of work, and as a slotter is a very handy tool to have in any machine shop the average size road will find such a tool preferable to a key seater, particularly where the amount of work is limited.

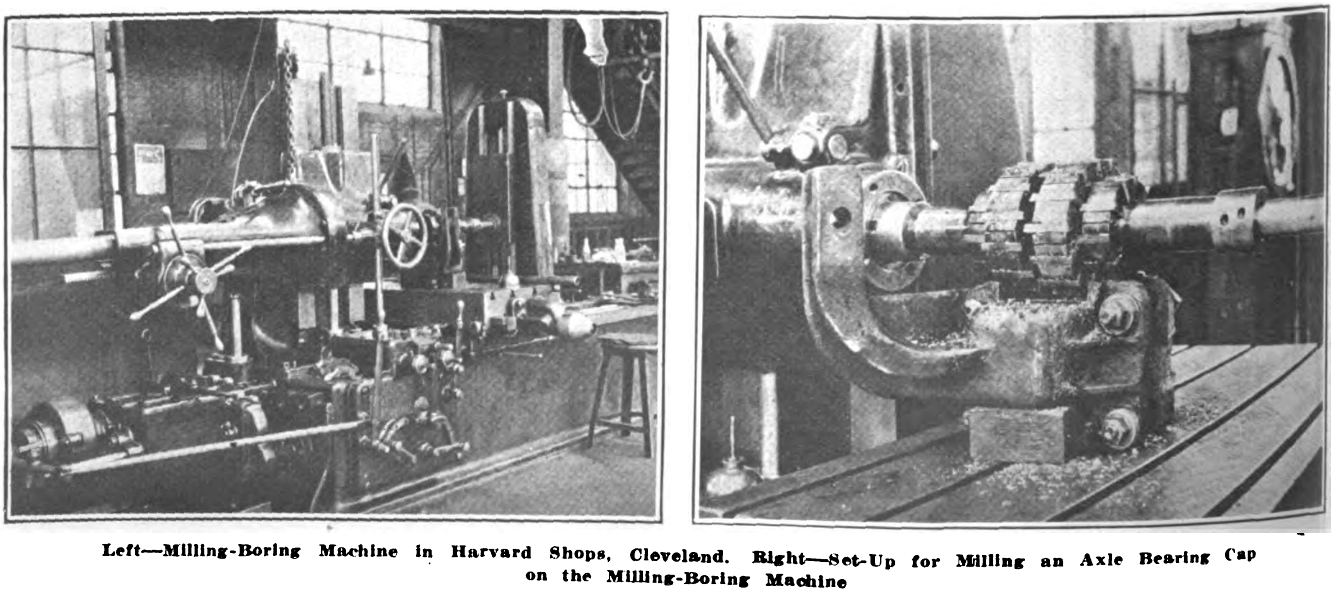
On the Pittsburgh Railways all key ways in armature shafts are cut with square bottom ends by means of a vertical head attachment to a universal milling machine. The machine used is a Milwaukee miller No. 1½, and when not in use for key ways is kept busy on other milling operations.

EFFICIENT METHODS OF MACHINING BEARINGS

The machining of bearings is another important part of the work done by electric railway mchine shops. Some of the larger properties purchase the rough castings for bearings and machine the outside as well as the inside bearing surfaces. The majority of electric railways, however, buy their bearing shells machined on the outside and bore these out to fit the particular shaft to which they are to be applied. Bearings also constitute an item requiring a large amount of maintenance repairs. Probably the majority of bearings in use by electric railways are of a babbitted type, with either an iron or bronze shell. Solid bronze bearings are coming into more general use, particularly for armature and axle bearings. Bearing wear takes place not only on the inside bearing surface but also on the outside part that fits into the motor housing, and also on the end flanges. So while new bearings may require boring only, it is evident that the maintenance of bearings requires finishing of other parts as well.

The time consumed in machining a bearing is comparatively small, and it thus becomes of increasing importance to provide equipment so that the bearings can be chucked quickly and accurately. Otherwise, the time consumed in getting the bearing ready for the machining operation may take fully as long as the machining itself. This has resulted in a large number of special designs of bearing chucks being used; in fact, as one visits the various railway properties nearly every shop has its own particular design of bearing chucks, which some one has devised for facilitating this work. A large number of the various designs used have been described in the columns of this paper from time to time. Where various sizes and types of bearings are used the chucks usually consist of one master chuck and subordinate bushings to fit the various bearings.

The Pittsburgh Railways uses special centers for holding armature bearing shells while turning in a lathe. The shell is swung between two tapered centers. The live center is three-cornered and has a 60-deg. taper,



Left—Milling-Boring Machine in Harvard Shops, Cleveland. Right—Set-Up for Milling an Axle Bearing Cap on the Milling-Boring Machine the three corners engaging grooves in the end of the shell. This serves as the drive. The dead center also has a 60-deg. taper and revolves. Mounted in this manner, it is possible to finish the entire outside length of the bearing shell, because there is no driving dog to interfere with the travel of the cutting tool. This method has reduced the time previously consumed for this operation by 25 per cent.

The Pittsburgh Railways also uses a special mandrel and clamp for turning split axle bearings on the outside. This holds the halves together and makes it possible to turn the halves as a unit on centers in the lathe. This job is completed in two-thirds of one man-hour. The former method of chucking the bearings in a four-jawed chuck and turning required one man-hour per set of two halves.

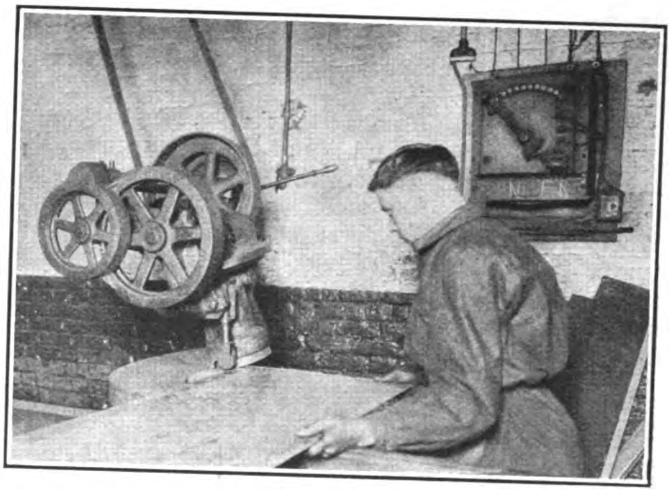
Axle bearing collars are bored on a drill press. This is accomplished by mounting the collar on a simple fixture or chucking device. The boring bar with the cutting bit is fed through the shells by the hand feed on the drill press. The time required for this operation, including the "set-up," is one-half man-hour per bearing collar. The former method of boring on an engine lathe required one and one-half man-hours.

In Chicago a surface grinder is used for finishing the faces of axle bearing shells previous to sweating them together for turning. This method gives approximately four times the output per day which was formerly obtained by doing this job on a planer or shaper.

SOME SPECIAL MACHINES USED IN BEARING WORK

Some electric railway shops have special bearing lathes and horizontal boring machines which have been purchased from machine tool manufacturers. An accompanying illustration shows a special boring machine used in several of the shops of the Brooklyn-Manhattan Transit Corporation for rough-boring bearings. These machines, of which the company has eight, were purchased from H. B. Underwood & Company and have tapered chucks for holding and centering the bearing and use a boring bar. This type of machine is very efficient, the chuck being arranged in two parts so that the jaws are separated or forced together by means of a screw with a hand wheel. The placing of a bearing in position for boring and its removal thus takes but a moment. The boring bar is provided with supports at either end, and the drive is through a pulley with bearings at the center of the lathe. The practice of the Brooklyn-Manhattan Transit Corporation is to rough-bore all bearings at one shop, but they are finish-bored at the maintenance shop, so as to fit the particular shaft to which they are to be applied. This company now purchases its bearings finished on the outside, so that the only machining operation is that of boring.

Railways which do the entire machine work on their bearings have frequent use for a turret lathe. Since the flanged portions of armature and axle bearings, as well as the outside and inside surfaces, require machining, several different tools are necessary. With the turret head, of course, the different tools can be placed in position and the various machining operations carried out without the necessity for rechucking the bearings. This saves time and labor and reduces the cost of the machine work.

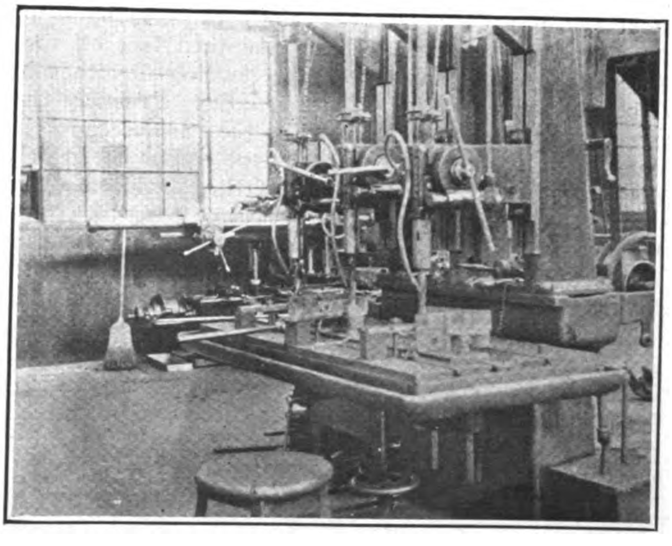


Serpentine Shear Handles Variety of Sheet Metals in C. S. L. Shop

A discussion of the various special tools and methods used in connection with babbitting and finishing babbitted bearings would take more space than is available in this article, but a special use of a standard buffing machine for removing excess babbitt shows a new use of an old-type machine which introduces a good economy.

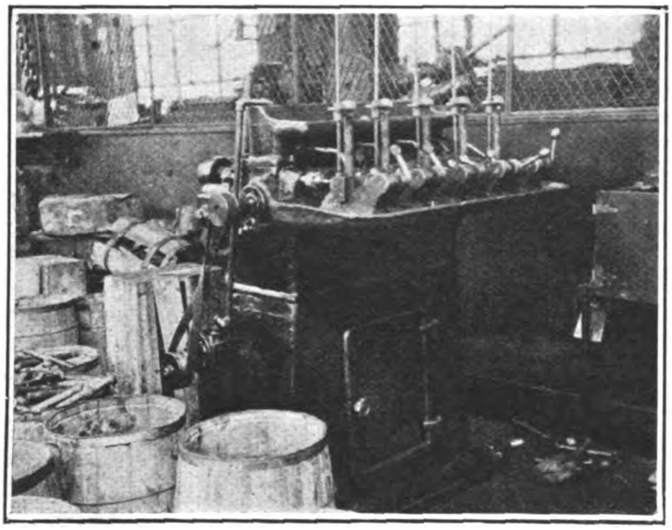
An accompanying illustration shows a single-spindle machine, such as would be used for ordinary buffing work, belt-driven from the center and fitted with wire brushes instead of buffing wheels. This machine is used in the East New York repair shops of the Brooklyn-Manhattan Transit Corporation for removing the hard coating of babbitt, scale, dirt and oxide from axle and journal bearings immediately after the babbitting has been completed. By using wire brushes of the proper diameter all excess metal can be removed very rapidly. The boring operation, which is carried on afterward, is thus facilitated.

The operation of brushing out this material is performed by placing the bearings on a wooden block, which serves as a carriage. This wooden block has a handle at the end, so that the operator can force the bearings underneath the rotating wire brush to remove the babbitt. This method is also used for opening up the side clearance to provide space for the lubricating oil to enter when the bearing is in service. In this latter case, instead of the bearing being moved in central with the rotating brush, it is forced to one side by the use of a spacing board. The babbitt is thus removed from



Drilling Brake Shoe Heads on a Three-Spindle Drill Press in Harvard Shops, Cleveland the side of the bearings, as would ordinarily be done by scraping, and the time necessary for finishing the bearing is cut to about one-tenth of what it would be by the old process.

This machine can also be used for the repair of worn bearings, where the useful life of the babbitt metal has not been entirely reached. In service, bearings wear on the crown and the metal is pushed to the side. Where bearings are removed and are again to be returned to service without rebabbitting the wire brush method is of particular advantage in opening up clearance at the side, instead of by scraping. The wire brushes also have an advantage in the quality of the finished surface, as it is much finer and without ridges, which sometimes occur when a bearing is scraped.



Drilling Holes in Brake Pins with Multiple-Spindle Horizontal Drill

This machine constitutes a part of the equipment of the babbitt room and has a sheet iron hinged guard, which is closed down while the machine is being used so as to prevent any danger of flying particles injuring workmen.

SPECIAL TOOLS AND JIGS FACILITATE REBORING OF MOTOR SHELLS

One of the most important tasks of the electric railway machine shop is the machining operation necessary to take up the wear in the axle and armature bearing housings of railway motors. Many railways build up housing fits by electric welding and then face off surfaces on a planer and rebore the housing fit either in a boring mill, a radial drill or a lathe. Probably the great variety of methods used in the various shops is due to the railways trying to adapt equipment which they already have to the needs of this work. A high standard of machine work is necessary for this maintenance, as many of the motor and bearing failures can be traced directly to poor standards of work or to poor fitting of the frame parts. A loose housing permits vibration of the armature, which in turn causes sparking at the commutator, loosening of the brushholders, insulation failures, burnouts, hot bearings, scored armature shafts and armature failures, the repair of which greatly exceeds the cost of doing this major machine work properly.

A very complete method of rehabilitating motors as carried out in the shops of the Kansas City Railways was described in the ELECTRIC RAILWAY JOURNAL for May 20, 1922. After building up the various worn surfaces by welding, the Kansas City practice includes the planing off of the motor frames on a planer, the boring out of the housing fits on a horizontal boring mill and the redrilling of various housing bolt holes on a radial drill. A large assortment of jigs and fixtures are necessary in order to insure accuracy of the work.

In the shops of the Chicago Rapid Transit Company motor shells are rebored in a large swing lathe by supporting the motor on a special jig laid across the lathe carriage. In one of the shops in Brooklyn an engine lathe is used for reboring motor shells by the addition of a geared shaft, so that four bearing fits are bored at one time. In another shop in Brooklyn the boring is done on a horizontal boring mill which has been changed from a one-spindle to a two-spindle unit. This also provides for the boring of the four housing fits at the same time.

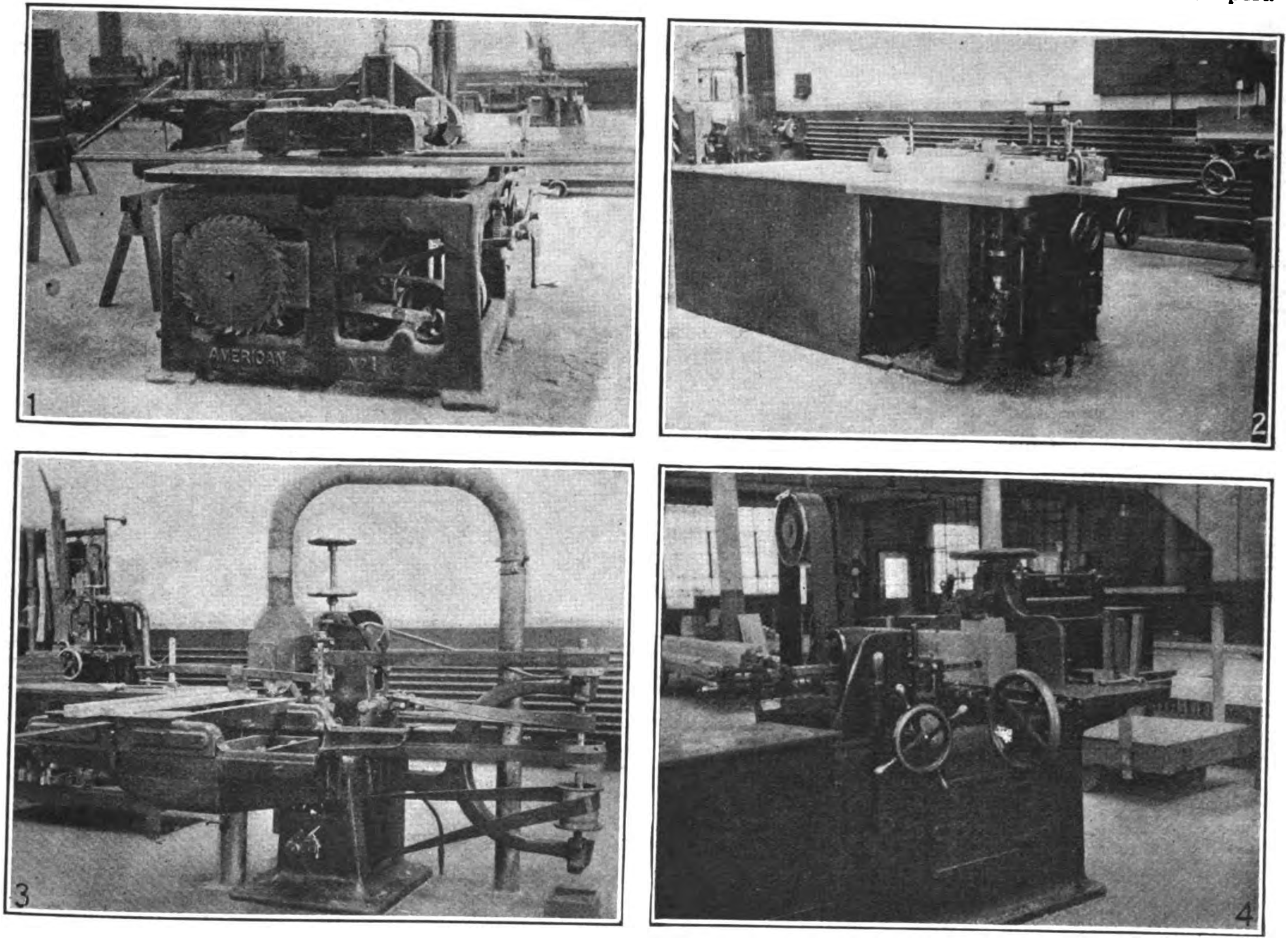
In the shops of the Philadelphia Rapid Transit Company a job of reboring some G.E.-80 motor shells was done on a vertical boring machine by providing a jig which was fastened to the motor shell, so that the entire shell, together with the jig as a unit, could be handled by a crane and placed in position for the boring operation and be moved from one boring position to the next without danger of causing inaccuracy of the boring.

In the shops of the Washington Railway & Electric Company, Washington, D. C., boring of motor shells is done on a radial drill, and in the Spokane United Railway Company's shops at Spokane, Wash., a McCabe 72-in. double-spindle lathe is used.

The Pittsburgh Railways uses a double-spindle horizontal boring machine for boring the axle and armature bearing housings of motor shells. The machine bores both bearing housings at both ends of the shell at the same time. This complete operation requires approximately three man-hours on this machine, while the same job on a single-spindle engine lathe would require nine man-hours. The time saving is effected by the elimination of three additional "set-ups" necessary on the ordinary engine lathe.

This gives an idea of the variety of methods and equipment used. An accurate comparison of the efficiency of the various methods is hard to determine, since the amount of rehabilitation work varies on different properties. In the methods where jigs are fitted to the motor complete the work includes not only the boring of the bearing fits but also motor shell caps and various redrilling of bolt holes. Some railways build up by welding and bore out to the original diameter, while others rebore to an enlarged diameter. The amount of work necessary is thus seen to vary widely with the different methods employed. It appears, however, that for the reboring operation alone a horizontal boring mill is the most efficient tool to use. This should be of double-spindle construction and should have an adjustment so that the distance between the spindles can be varied to suit various types of motors. The maximum distance between the spindles will be determined, of course, by the maximum distance between the armature and axle bearings on the motors being machined.

Another job on motor shells being carried out by the Philadelphia Rapid Transit Company is the finishing of some new end castings for motors. Originally these motors were of a non-ventilated type. The company is now replacing the end casting so as to provide for ventilation. This work is being done on a Bullard vertical turret lathe. A total of nine cutting tools are used in the machining operation and the vertical head is equipped with five tools and the side head with four tools. In addition to the machine work in the vertical turret lathe, a considerable amount of drilling and spot facing is necessary. This work is done on a radial drill. The economies resulting from the use of these modern tools in connection with this work are considerable, and after this particular machining job is finished the tools will be available for other work which can be done much more economically on this class of equipment than on other older machine tools.



Four of the Modern Woodworking Machines that Helped Eliminate 90 per Cent of the Hand Work in the Cleveland Railway Carpenter Shop
1. Self-feeding rip saw. 2. Double-spindle shaper. 3. Tenoning machine. 4. Hollow chisel mortiser

Other Tools that Show Economy

Bolt-threading machines are tools that produce marked economies in connection with the maintenance of motor shells, as motor shell bolts become broken and the threads are burred so that it is necessary to re-thread them or provide new threads in the various nuts used. Bolt-threading machines in railway shops are kept very busy on other maintenance repair work in addition to that required for motors. A large number of bolts are used on electric railway equipment, and in addition there are many threaded rods, such as brake levers, truck rods and coupler parts. Turnbuckles are used for adjustment in the brake rigging and these require tapping. As these have both a right and a left hand inside thread, reverse motion of the bolt-threading machine is required. As the air brake equipment on cars requires considerable pipe, a combined bolt and pipe threading machine is of advantage, particularly on the smaller properties, which would not have sufficient work to keep a single-purpose machine of each type busy. A size which will take 1½-in. stock is large enough for the work on the majority of electric railways.

A special machine for a number of machine operations is the milling and boring tool, known as the Lucas "Precision" No. 32 milling machine, as used in the shops of the Cleveland Railways. On the particular operation shown in the accompanying illustration the machine is being used as a milling machine for finishing Westinghouse No. 340 axle bearing caps. Four milling cutters are mounted on the spindle of the machine. The large cutter in the center has side cutting blades, in addition to the usual surface blades. With such a combination of milling cutters, it is possible to finish the bottom, sides and shoulders of the cast iron bearing cap at one operation, following the building up of the cap by electric welding. A saving of 20 per cent in time has resulted by the use of this machine rather than a shaper for performing this particular job.

This "Precision" machine is also used for finishing truck pedestal jaws. The side member of the truck frame is placed in the machine in such a position that the pedestal jaws are on top. A large size milling cutter finishes both sides and the top of the jaw. In doing this particular job the "Precision" machine effects a saving of 75 per cent in the time required to do the same operation on a shaper. The "Precision" milling-boring machine may also be used for boring 34-in. steel wheels.

Another job in the shops of the Cleveland Railways consists of drilling brake shoe heads for the brake pin on a three-spindle drill press. This operation is progressive and the machine is equipped with automatic feed and cutout. The cutout feature returns the drill to starting position. For this particular job of drilling the time required per head is approximately two and one-half minutes. When this work is done on a single-spindle drill press the time required for the operation is doubled.

Another drilling job consists of using a multiple-spindle horizontal drill for drilling cotter key holes in large size rods, bolts and brake pins. The machine has automatic feed and return for the drills. The action of the five drills is progressive, and the time required for drilling a ¼-in. hole in a 1-in. pin is one and one-half minutes. On a single-spindle drill press the same operation requires six minutes.

A serpentine shear has proved an extremely useful machine tool in the shops of the Chicago Surface Lines. Its cost is comparatively low and it will handle a wide range of sizes of sheet materials. The machine illustrated will take material up to 3/16 in. thick and can be used both for straight cuts and for making irregular shapes.

THE TOOL-SHARPENING MACHINES ARE KEPT SEPARATE

Emery wheels are set aside for grinding cutting tools in the Chicago shop. This results in improved workmanship and a considerable saving in expensive high-speed tool steel. For grinding castings and other rough work coarse-grained wheels on other grinders do faster work so that keeping the tool-grinding wheels separate is of advantage.

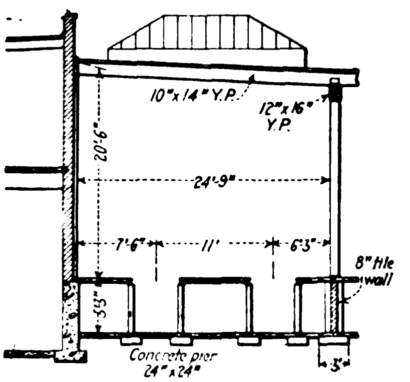
Modern machine tools are used in the woodworking department at the Harvard shops of the Cleveland Railways to such an extent that almost every operation in woodworking is performed by machine. A 12-in. molding machine which is capable of making almost anything out of wood is used for cutting tongued and grooved flooring, making floor strips, ceiling molding, car trim and other details of car construction. A hollow chisel mortiser is used for mortising buffer timbers and sills and members of the body underframe. In door construction and repair work the tenoning machine eliminates approximately 90 per cent of the time usually consumed by hand work. The machine cuts the tenon on the end of a door member and at the same time it cuts the recesses in the shoulder for receiving the molding of the mortised piece, thus saving additional handling.

Cutting buffer timbers and sills is done on a self-feeding rip saw. It is possible with this machine to cut flooring out of large timbers.

A double-spindle shaper is used as a universal machine for cutting lighter work than the 12-in. molding machine. The double-spindle shaper, however, is capable of performing the same variety of work, being used for roughing out vestibule and car body corner posts and molding.

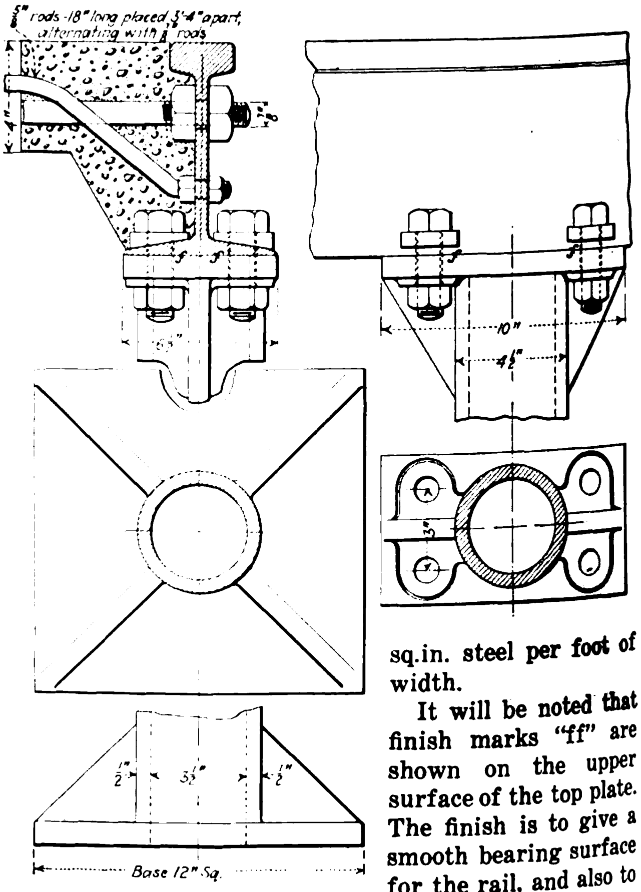
Carhouse Rails Supported on Cast-Iron Standards

IN THE United Electric Railways' new carhouse at East Providence, R. I., the rails in the pit section are supported on special cast-iron columns, of which details are shown in the accompanying illustrations. The general layout of the carhouse was covered in the issue of this paper for August 11, 1923, page 216.



Cross-section of Part of East Providence Carhouse, Showing Rail and Walkway Construction

A column is cast in pipe form, of 4½ in. outside diameter, with a square base and a rectangular top. The top is 10 in. long, measured along the rail, and 5½ in. wide, with four bossed holes for bolts to provide attachment to the rail, the base of which is drilled correspondingly. The columns are spaced about 10 ft. along the rail. The concrete runway which fills the space from track to track is of strongly reinforced concrete 4 in. thick. The reinforcing consists of ⅝-in. rods, 18 in. long, bent as shown, alternating with ⅞-in. tie rods for the rails spanning the complete width of the runway. The ⅝-in. rods are spaced 3 ft. 4 in. apart, alternating with the ⅞-in. rods, so that the distance between centers of adjacent rods is 20 in. The plans call for reinforcing of slab as follows: For 6 ft. 1¼ in. spans place 0.3 sq.in. steel per foot of width; for 3 ft. 9⅝ in. spans place 0.1 sq.in. steel per foot of width.

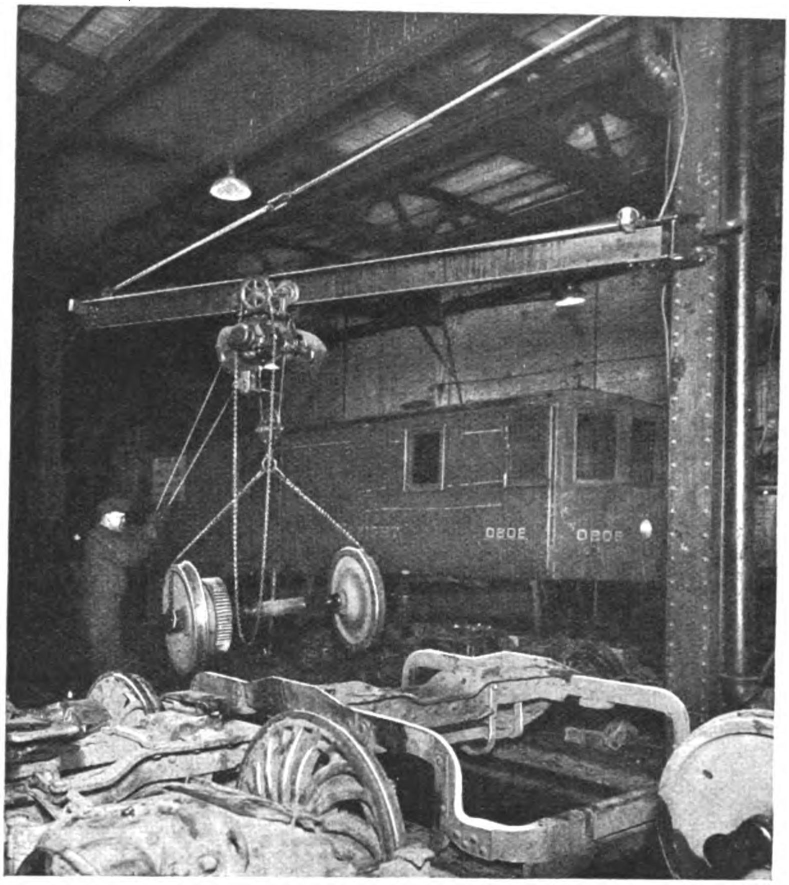

⅝" rods -18" long placed 3'-4" apart, alternating with ⅞" rods
4"
⅞"
f
f
6½"
10"
4½"
3"
½"
3½"
½"
Base 12" Sq.
Details of Cast-Iron Column and Concrete Walkway Construction in East Providence

It will be noted that finish marks "ff" are shown on the upper surface of the top plate. The finish is to give a smooth bearing surface for the rail, and also to correct for inequalities in height.

A Picture Story Showing Many Uses to Which

Special Handling Equipment

Can Be Put in Electric Railway Work



Electric Hoist on a 10-In. Swinging I-Beam, in the Shops of the Worcester Consolidated Street Railway. Motors, Wheels and Trucks Can Easily Be Moved from One Track to Another with This Apparatus

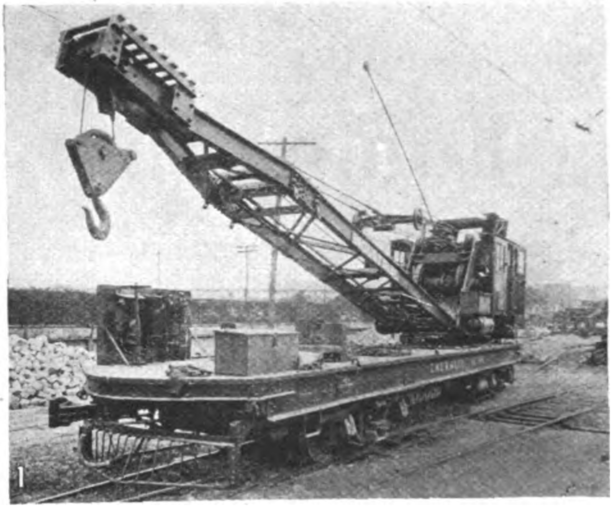
IN HANDLING MATERIAL and parts of every description, the electric railway industry has problems of peculiar difficulty compared with those of other industries. Much of the material to be handled and transported is extremely heavy. Wheels, axles, motor cases, rails, etc., are not only heavy but also unwieldy. On the other hand the electric railway has a distinct advantage in that it has electric power available to operate handling machinery, or compressors to provide an ample supply of compressed air.

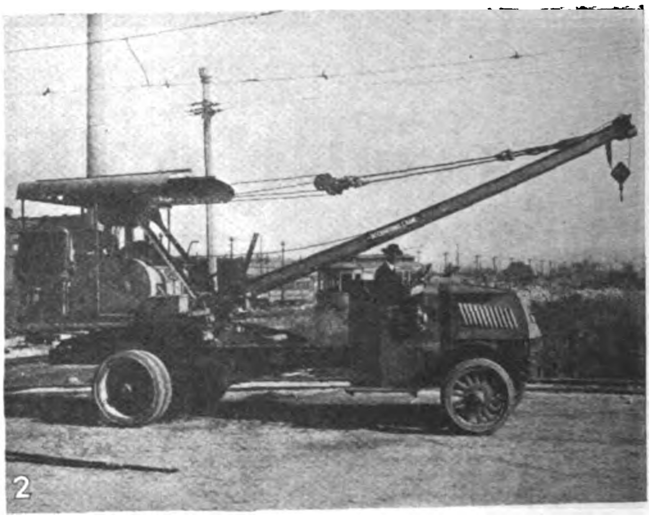
Electric crane cars of various designs are used extensively. They have proved to be of great value as labor savers. For example, such a crane with a crew of one operator and two men can load or unload between 500 and 600 wooden ties per hour. Doing the same work by hand would require twelve men for some two and one-half hours. Moreover, the ties can be piled to a height of 18 ft. when the crane is used, compared with only 12 ft. when piled by hand. When handling cages of wood paving blocks a crane can dump approximately 18,000 blocks per hour. This would otherwise require twelve men for four hours.

It is the practice on some railways for the shop department to relieve the stores department of handling wheels, axles, motors and armature shafts. Special machinery is useful for transporting material from one portion of the storage yard to another, or from the storage yard to the shop. Pneumatic, electric and chain hoists are an essential part of such an arrangement. These are usually arranged to operate on an overhead monorail track of 8-in. or 10-in. I-beams. Switches and curves in the monorail system permit material to be transported quickly and easily around the shop.

Special handling machinery has been developed for various purposes. Electric shovels and caterpillar tractors are useful. Dump cars arranged to unload in the shortest possible time prevent interruptions to passenger car service. Loading machines can be used for numerous purposes.

A number of typical uses to which various electric railways are putting special handling equipment in the shops and yards, and on the street, are illustrated on the following pages.





Cranes and Shovels at Work

No. 1. 15-ton crane car built by T. M. E. R. & L. Co.

No. 2. An International crane mounted on a Mack truck is used by Cleveland Railway.

No. 3. Propelling Unit built by Differential Steel Car Company moves on car wheels or caterpillar tractor.

No. 4. Derrick with 100-ft. boom in Denver Tramway's material yard.

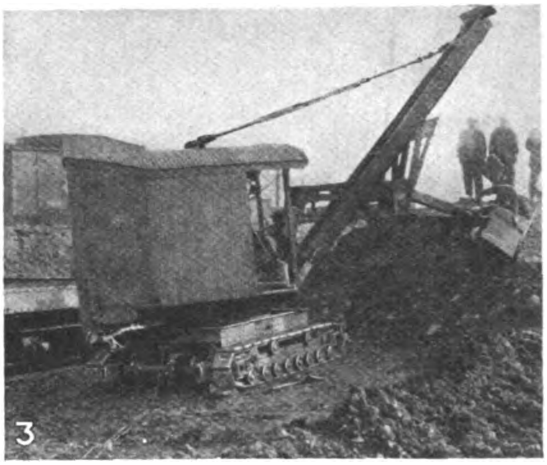
No. 5. Crane car built by Buffalo & Lake Erie Traction Company.

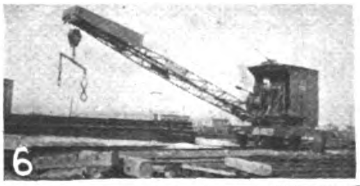
No. 6. Derrick with special tongs for handling rail.

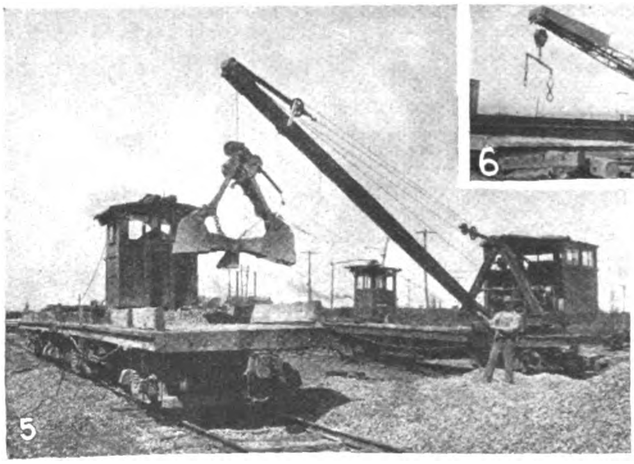
No. 7. A wood insulating guard at outer end of boom is an interesting feature of this electric crane.

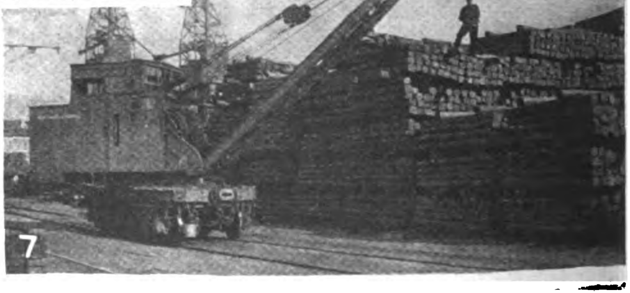
No. 8. McGuire Cummings 3-ton crane car used by Connecticut Co.

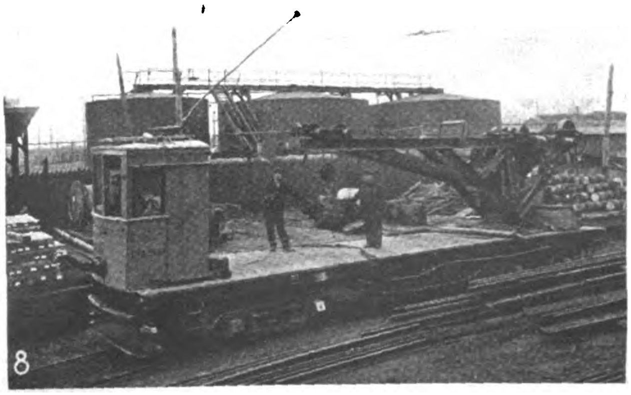
No. 9. A crane equipped with an electromagnet is used by the Boston Elevated Railway for handling iron scrap.

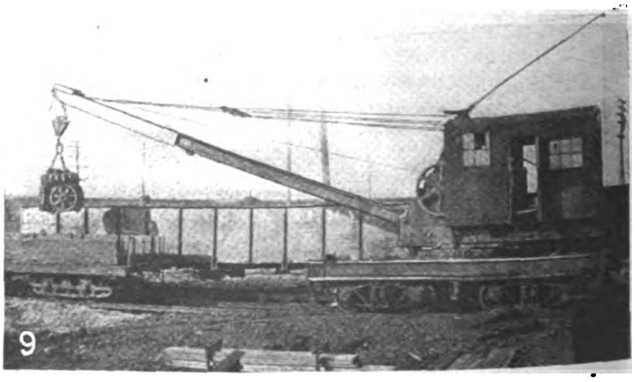


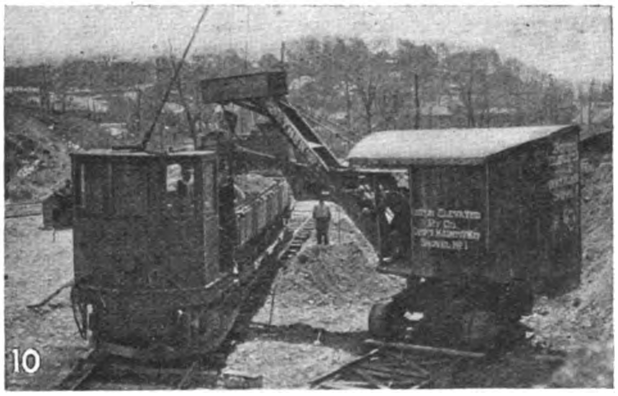


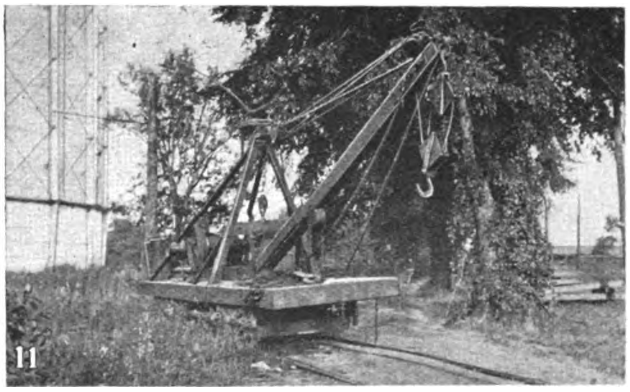


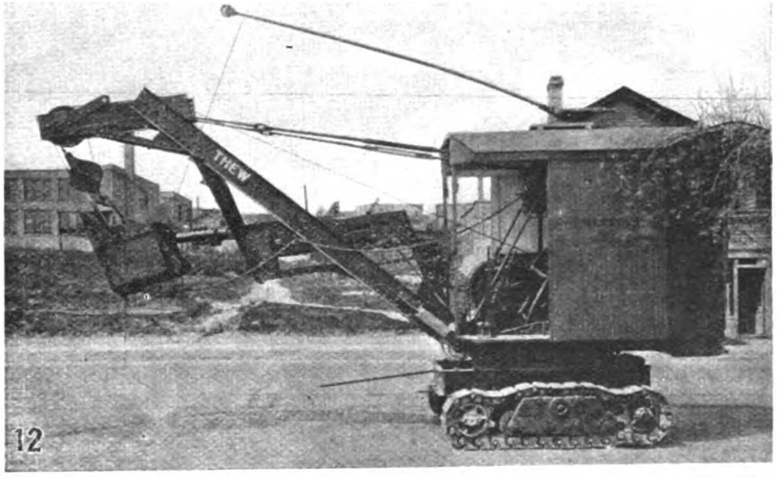







10

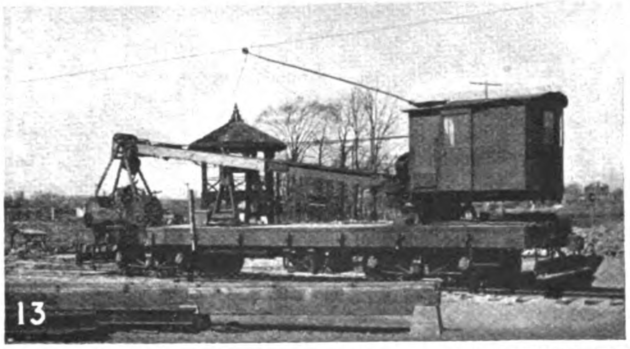

11

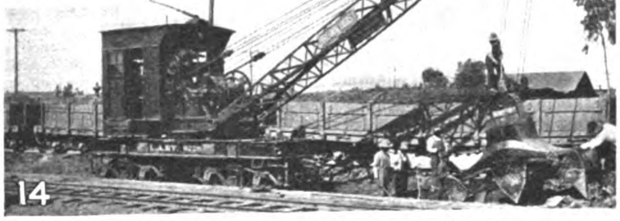


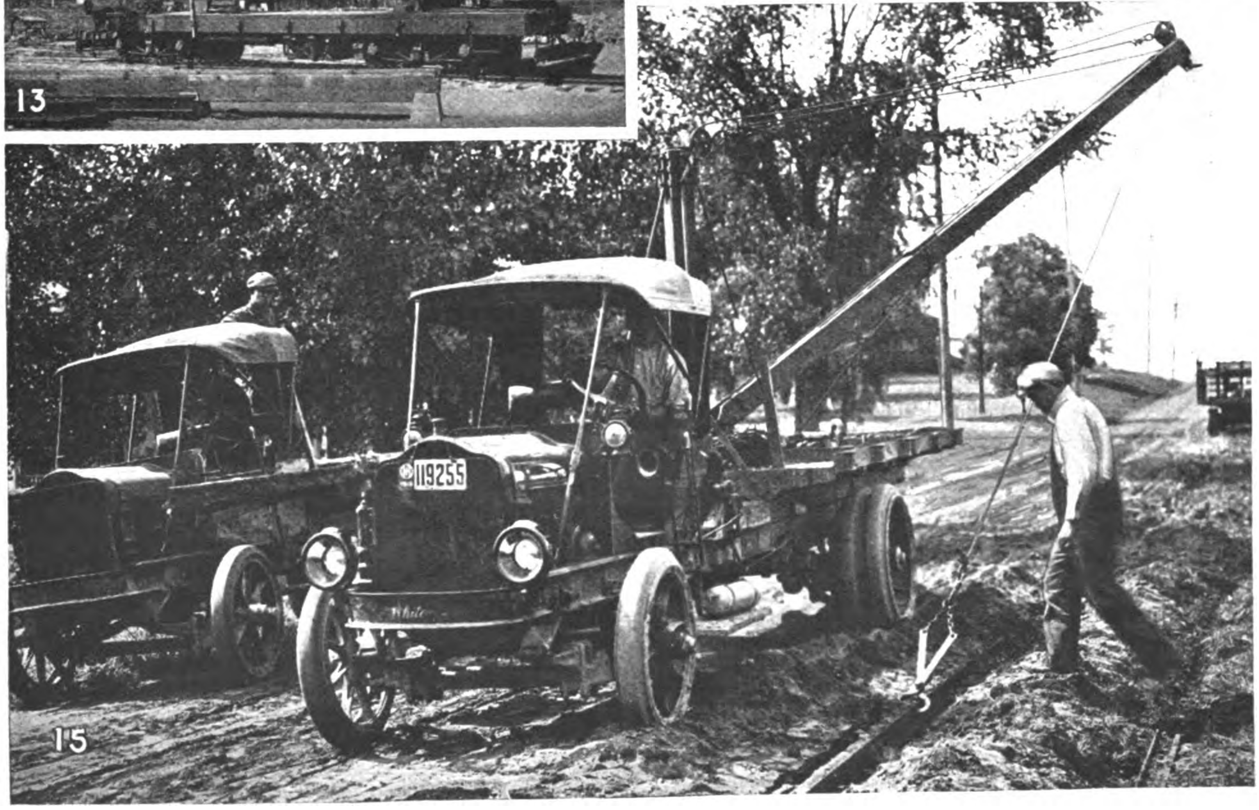
12

Mobility Features This Equipment

No. 10. Gravel being loaded into a Universal work car by means of a Thew shovel.
No. 11. A self-propelled hand operated derrick car for use in placing special work on the New York State Railways, Rochester.
No. 12. Thew shovel with caterpillar tractor used by T. M. E. R. & L. Co.
No. 13. Brownhoist used by the New York State Railways, Rochester.
No. 14. Self-propelled crane car equipped with a special clamshell bucket is used by the Los Angeles Railway.
No. 15. Power winch mounted on a White motor truck provides a convenient means to tear up old rails and ties.

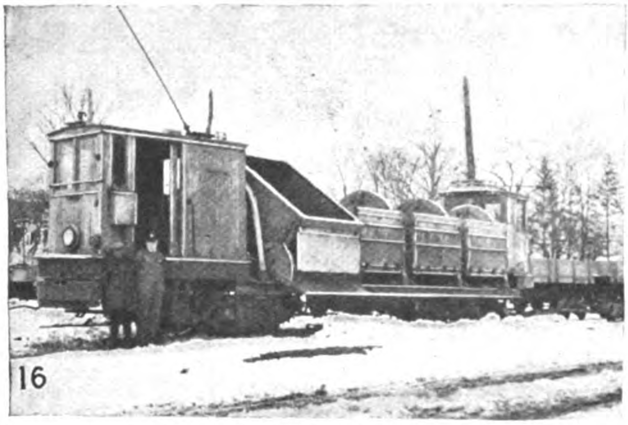

13


14

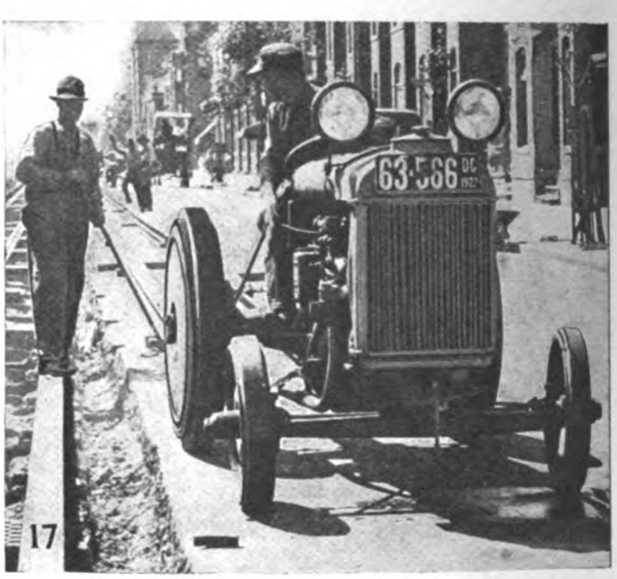


15

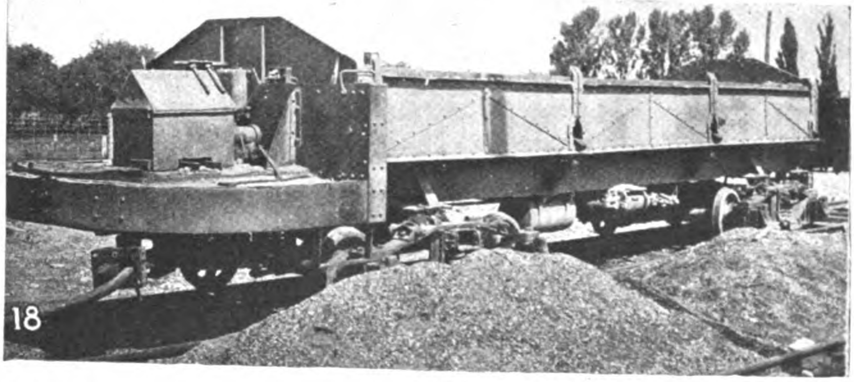
The Time Element Is Important in the Loading and Unloading and Placing of Materials



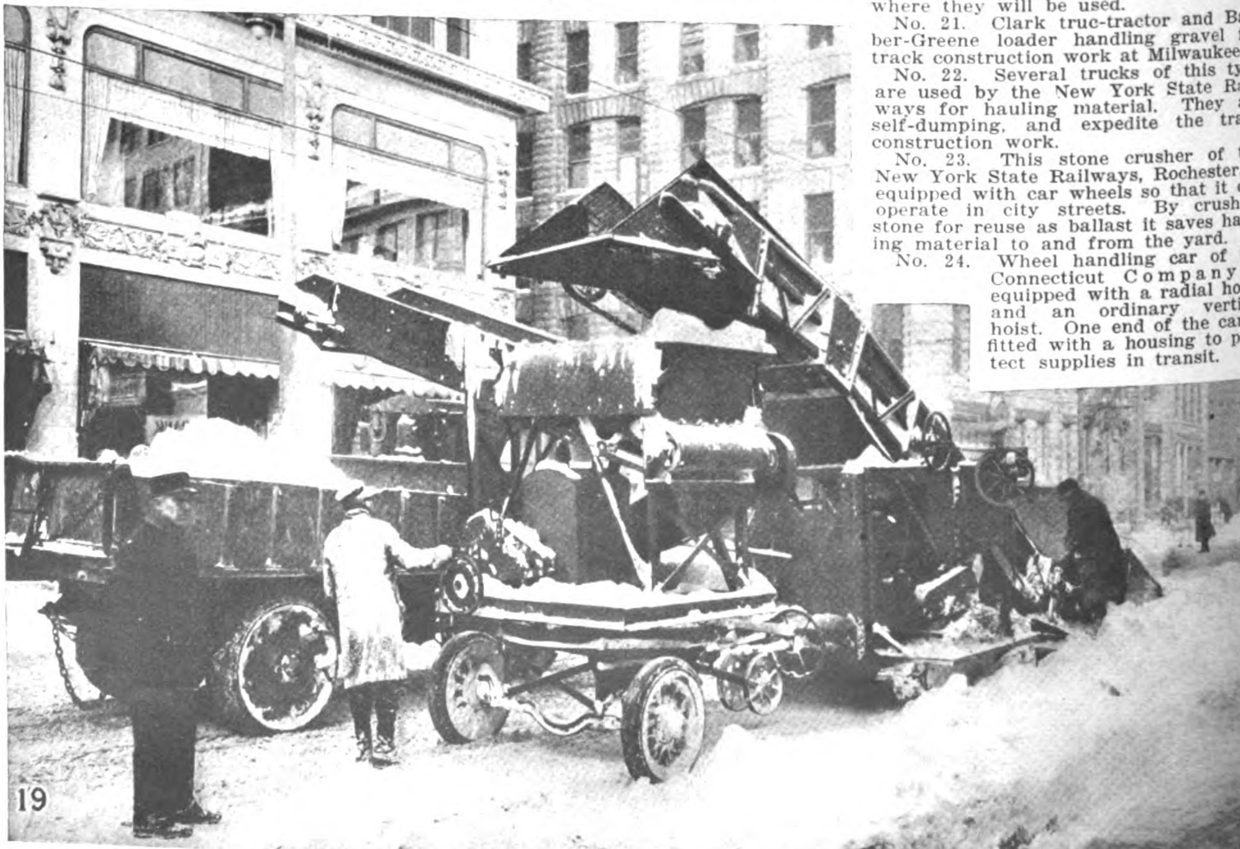
16



17



18



19

No. 16. Each of the four compartments of this car built by the Connecticut Company has a capacity of 6 cu.yd. It is dumped by electricity and can be unloaded in four minutes.

No. 17. Track rail is pre-welded by the Washington Railway & Electric Company and hauled to position in 420-ft. sections by a Fordson tractor.

No. 18. This Differential dump car is a big labor saver in handling track material for the New York State Railways.

No. 19. A Barber-Greene snow loader equipped with a transverse loading device designed by T. M. E. R. & L. Co. to facilitate rapid movement of the trucks. These proceed beside the loader in the direction of traffic without the necessity of backing into position.

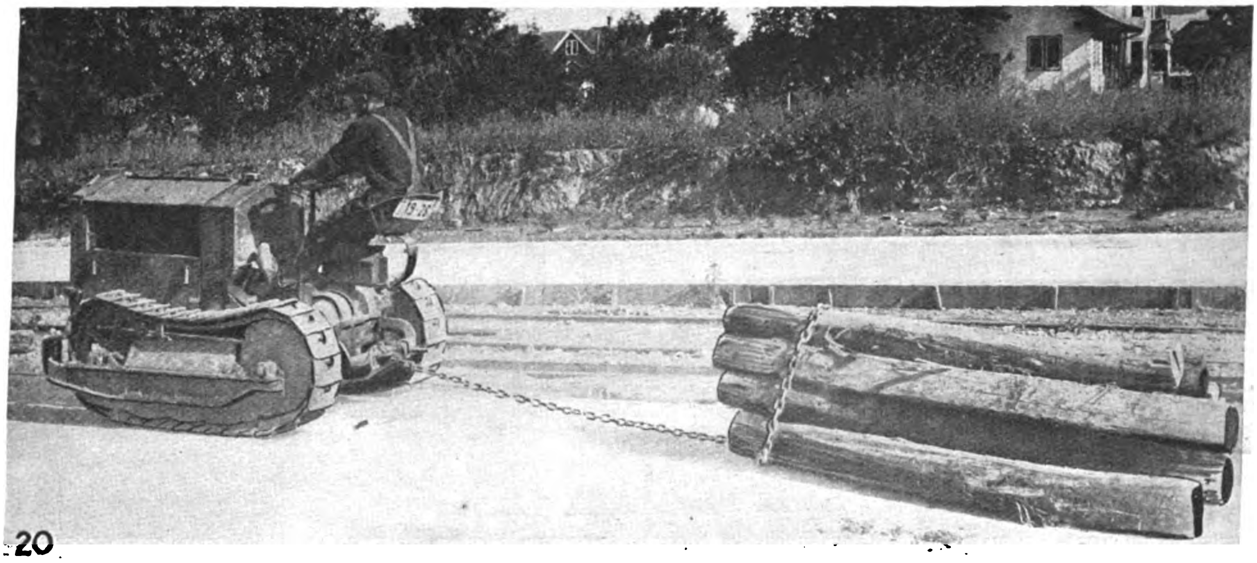
No. 20. A Cleveland caterpillar tractor is used at Milwaukee for hauling track and paving materials to the place where they will be used.

No. 21. Clark truc-tractor and Barber-Greene loader handling gravel for track construction work at Milwaukee.

No. 22. Several trucks of this type are used by the New York State Railways for hauling material. They are self-dumping, and expedite the track construction work.

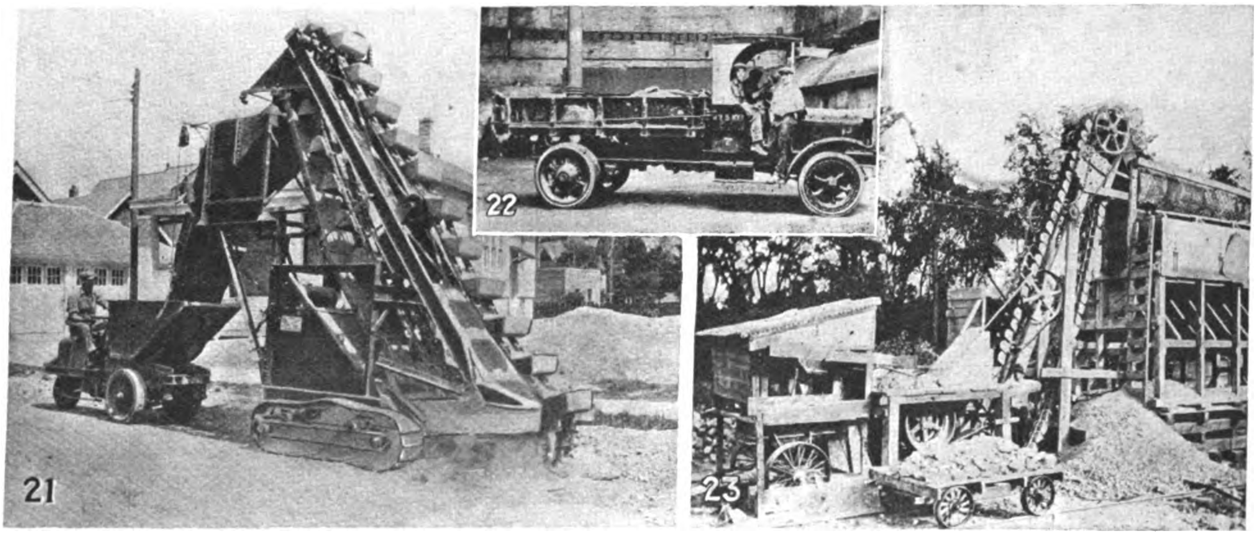
No. 23. This stone crusher of the New York State Railways, Rochester, is equipped with car wheels so that it can operate in city streets. By crushing stone for reuse as ballast it saves hauling material to and from the yard.

No. 24. Wheel handling car of the Connecticut Company is equipped with a radial hoist, and an ordinary vertical hoist. One end of the car is fitted with a housing to protect supplies in transit.



20

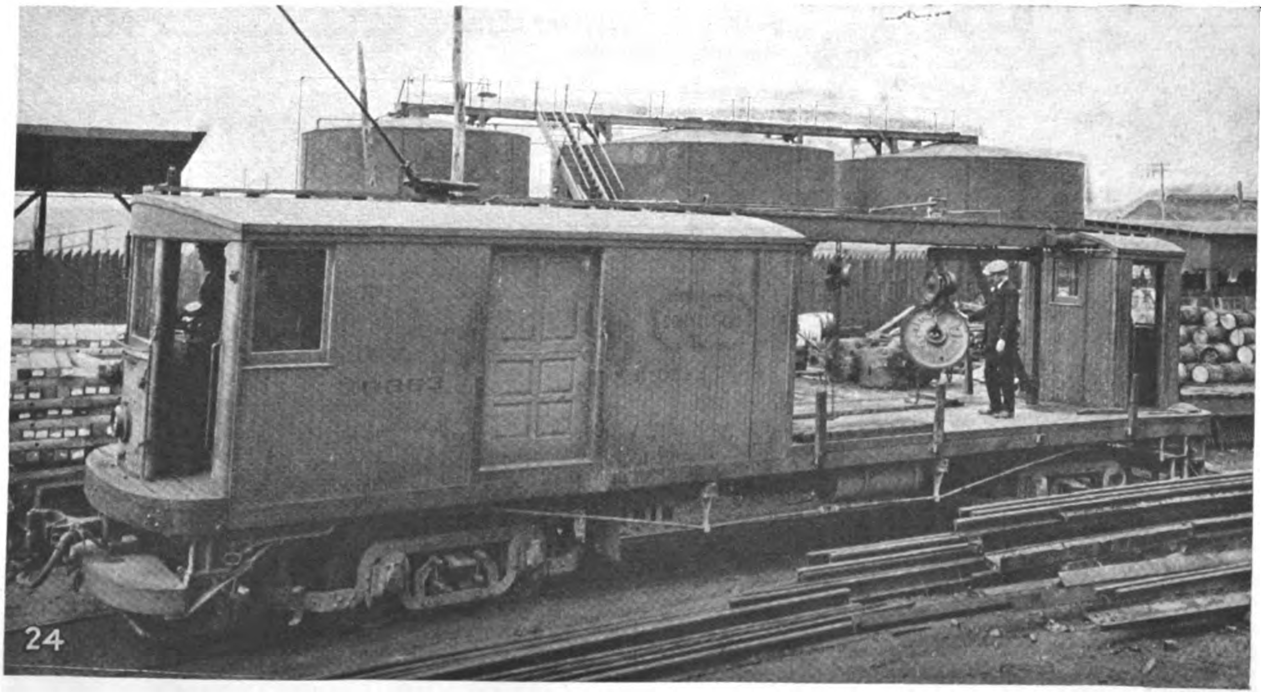
Special Uses of Special Equipment



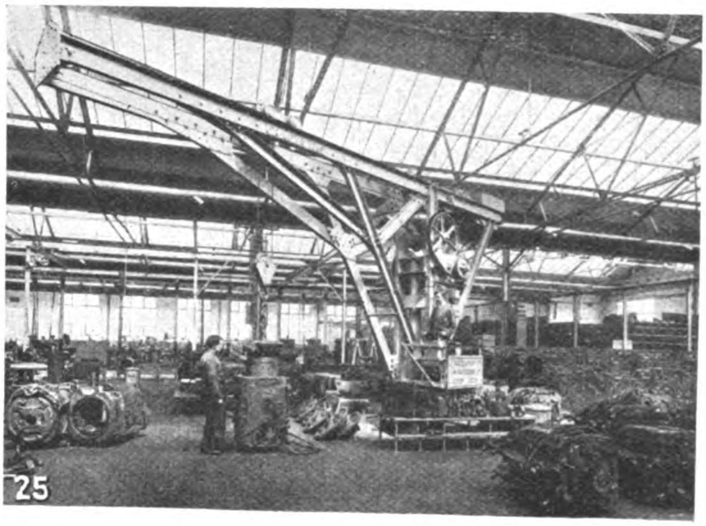
21

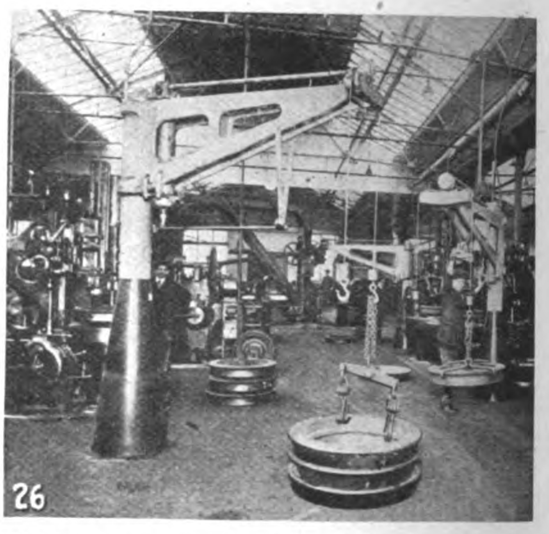
22

23



24





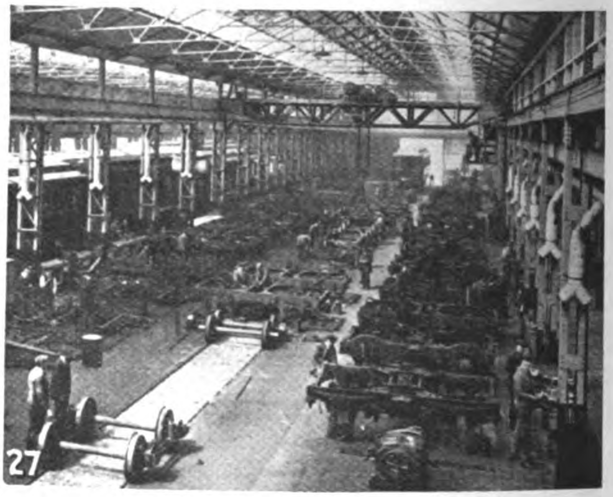
New Shops of the London Underground at Acton Have Unique Handling Machinery

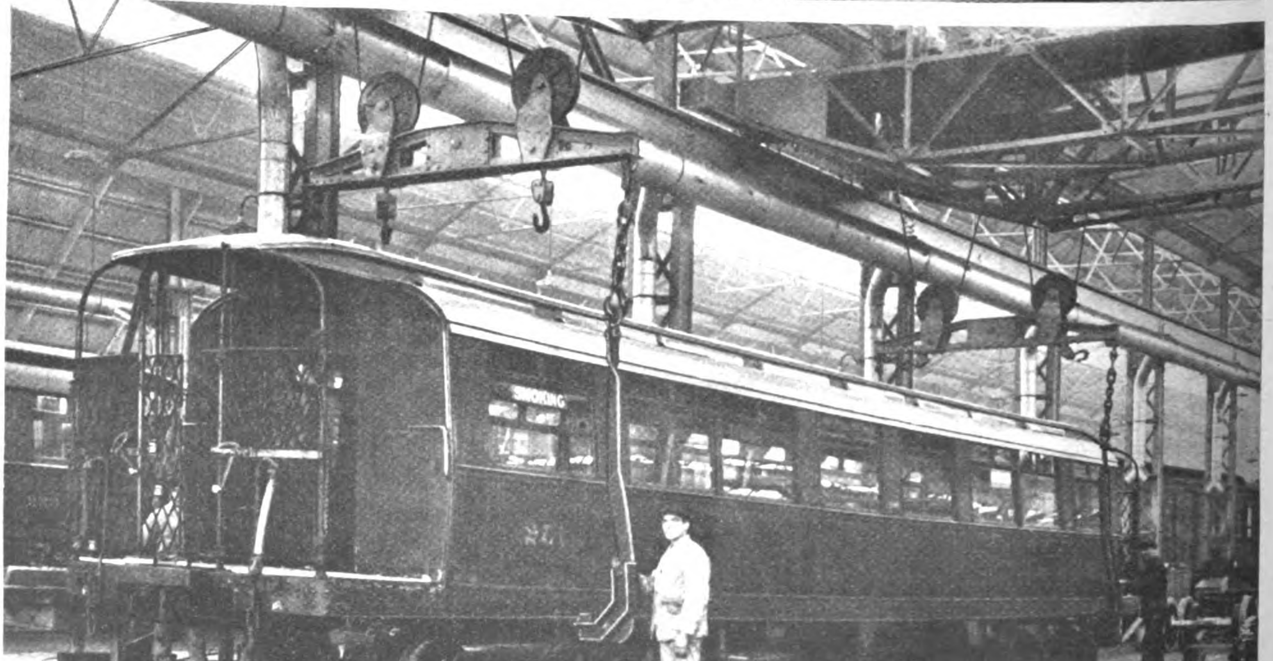
No. 25. A 3-ton jib crane in the new Acton shop of the Underground Electric Railways of London.

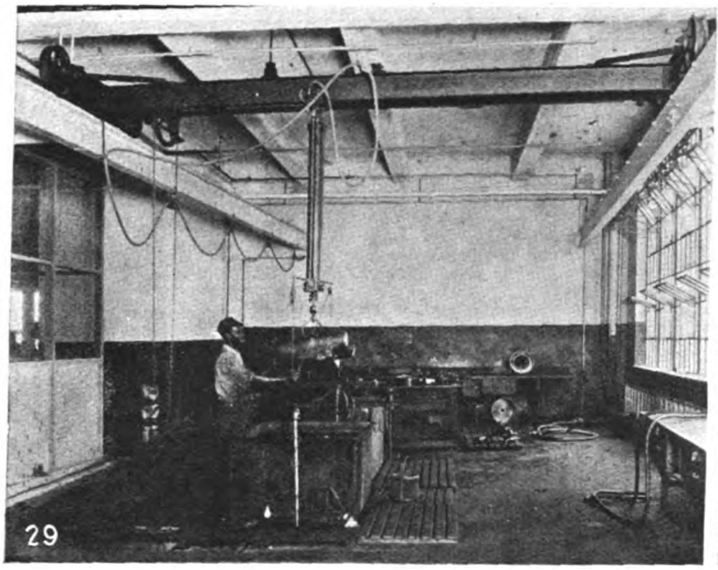
No. 26. A pedestal type crane at Acton equipped with yoke and multiple hooks.

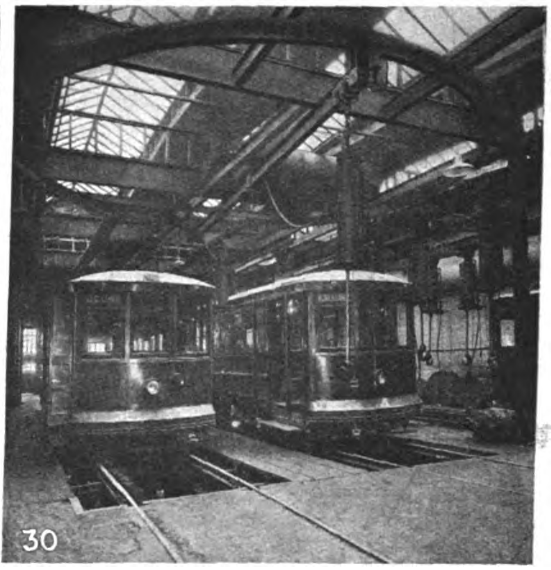
No. 27. A traveling crane used in the truck overhauling shop of the London Underground.

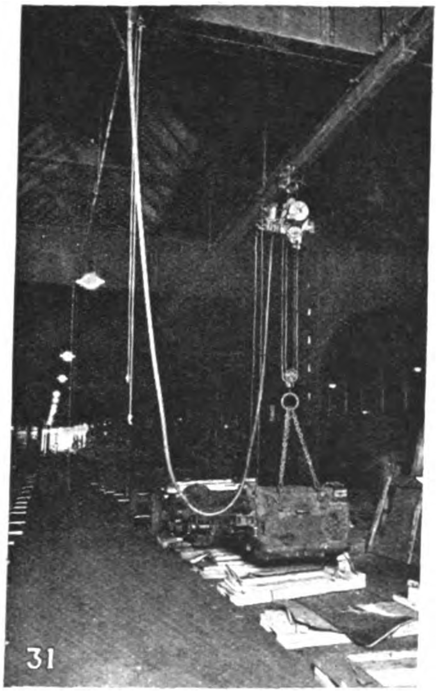
No. 28. Method of lifting car bodies from the trucks at Acton. A pair of hooks is placed under the body at each end.






29


30


31

Hoists and Cranes Used in Shops

No. 29. This small capacity pneumatic hoist is convenient for handling such parts as gear cases, motor and armature bearings.

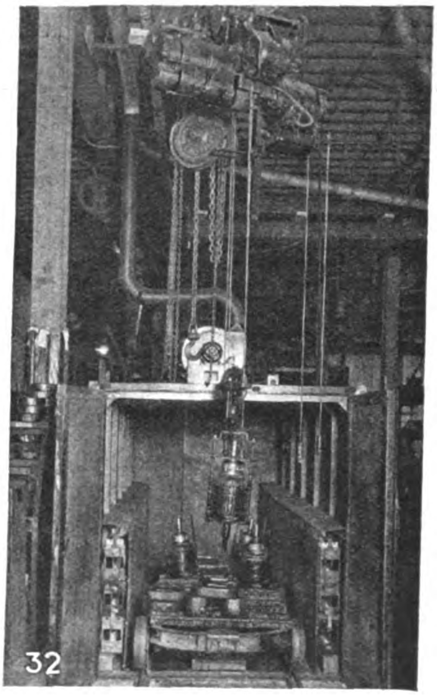
No. 30. Heavy air hoists used by the Saginaw Transit Company to raise car bodies from the trucks. These are mounted so as to hang just outside the car body and can raise a 40,000-lb. steel car.

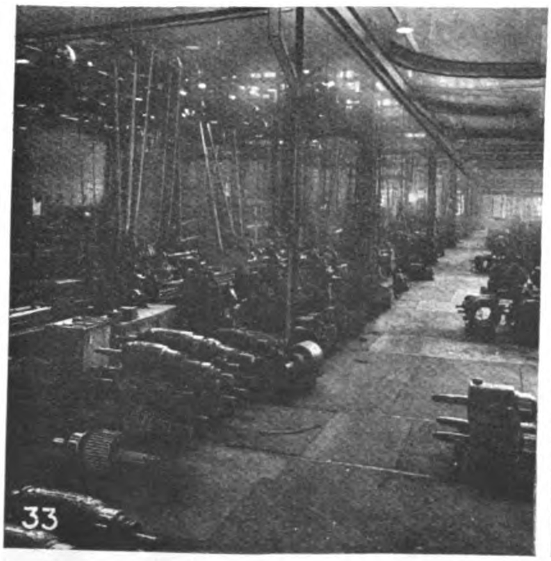
No. 31. Thor 2-ton pneumatic hoist used for handling car wheels, axles, motors and armature shafts, by the Chicago Rapid Transit Co. This hoist is one of two used on a monorail system.

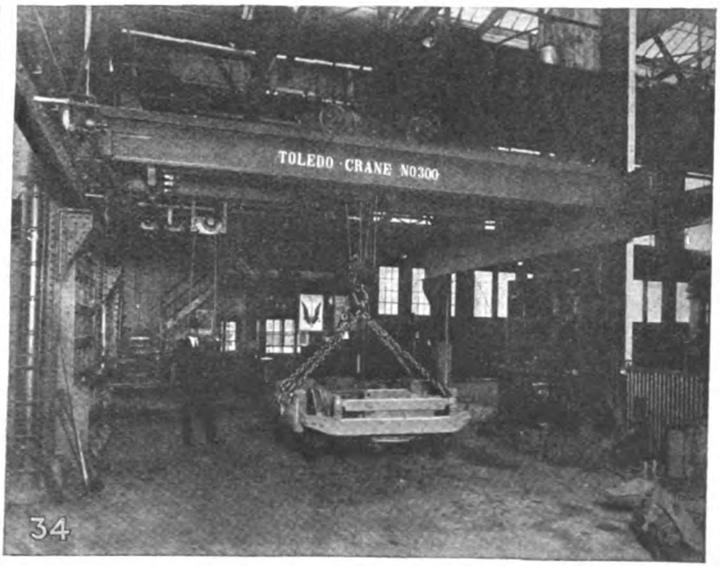
No. 32. In the shops of the Long Island Railroad the armature room is equipped with an overhead monorail system and pneumatic hoists.

No. 33. A complete monorail system has been installed in the shops of the United Railways of St. Louis. Each important machine tool handling heavy material is served by a jib crane with an air or chain hoist. Switches in the overhead rail system allow materials to be transported anywhere in the shop.

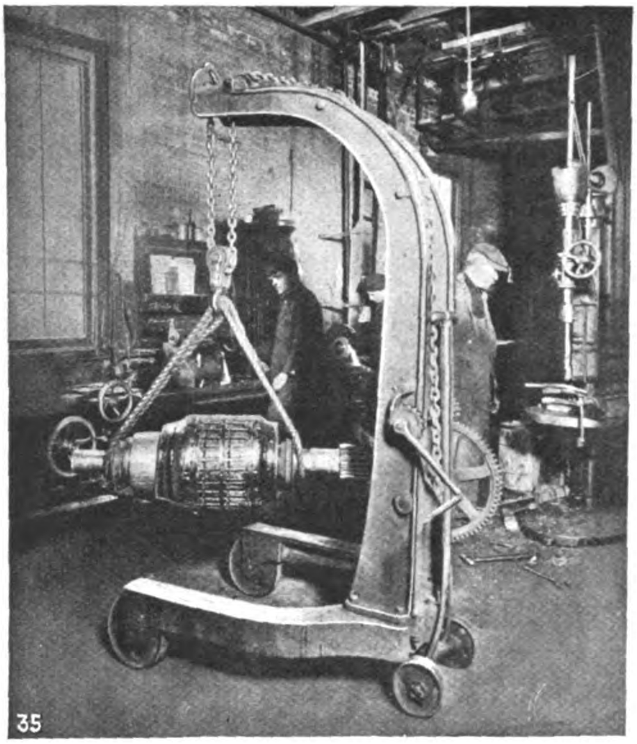
No. 34. Overhead Toledo crane used for handling motors, trucks, and other heavy parts in the shops of the Cleveland Railway.

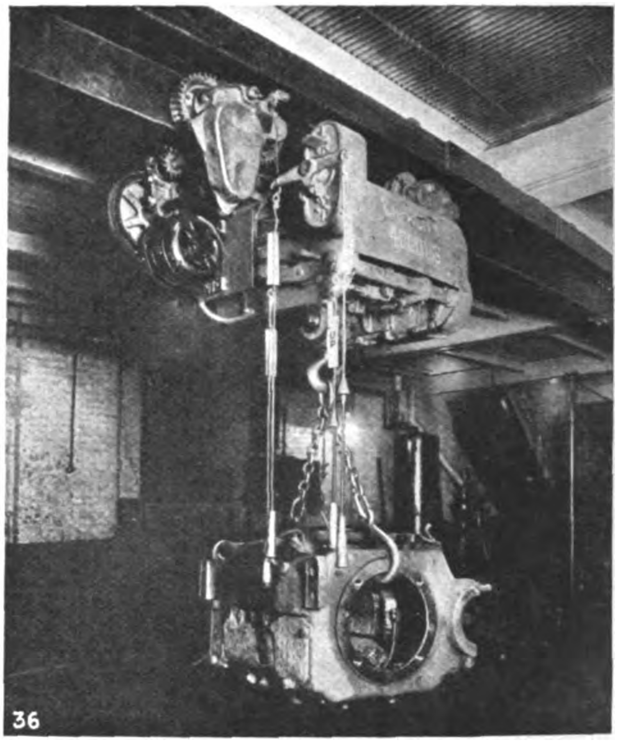

32


33



34

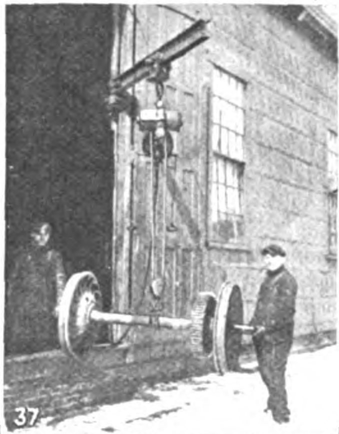

35


36

Shop Efficiency Is Promoted by Having Convenient Handling Equipment

No. 35. For handling armatures while making bench repairs a portable hoist has been found a great convenience in Rochester.

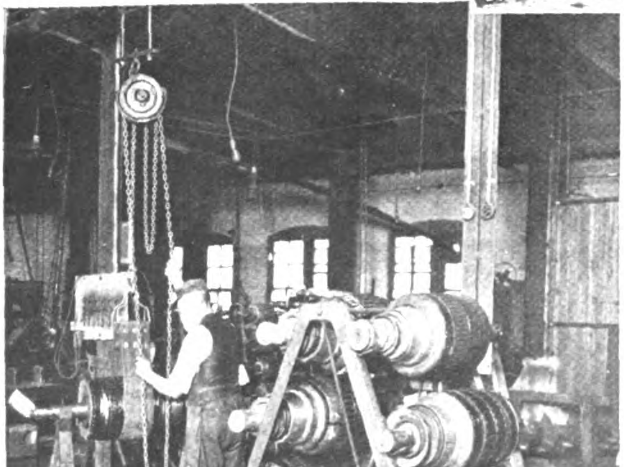
No. 36. This 4,000-lb. crane has been found particularly serviceable in the motor repair department of the East St. Louis & Suburban Railway. Not only armatures, motor shells, etc., but also completely assembled motors are handled.

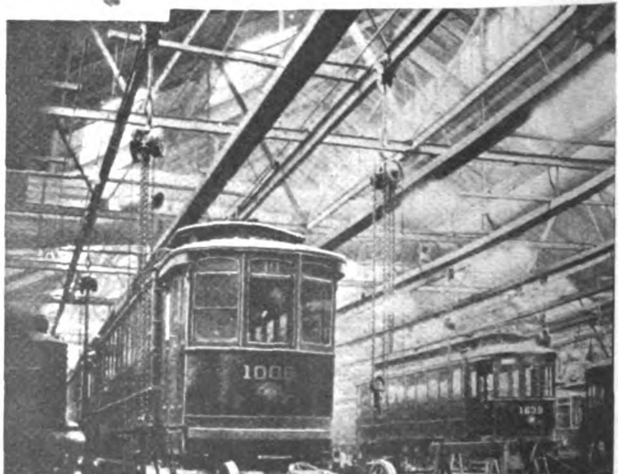

37

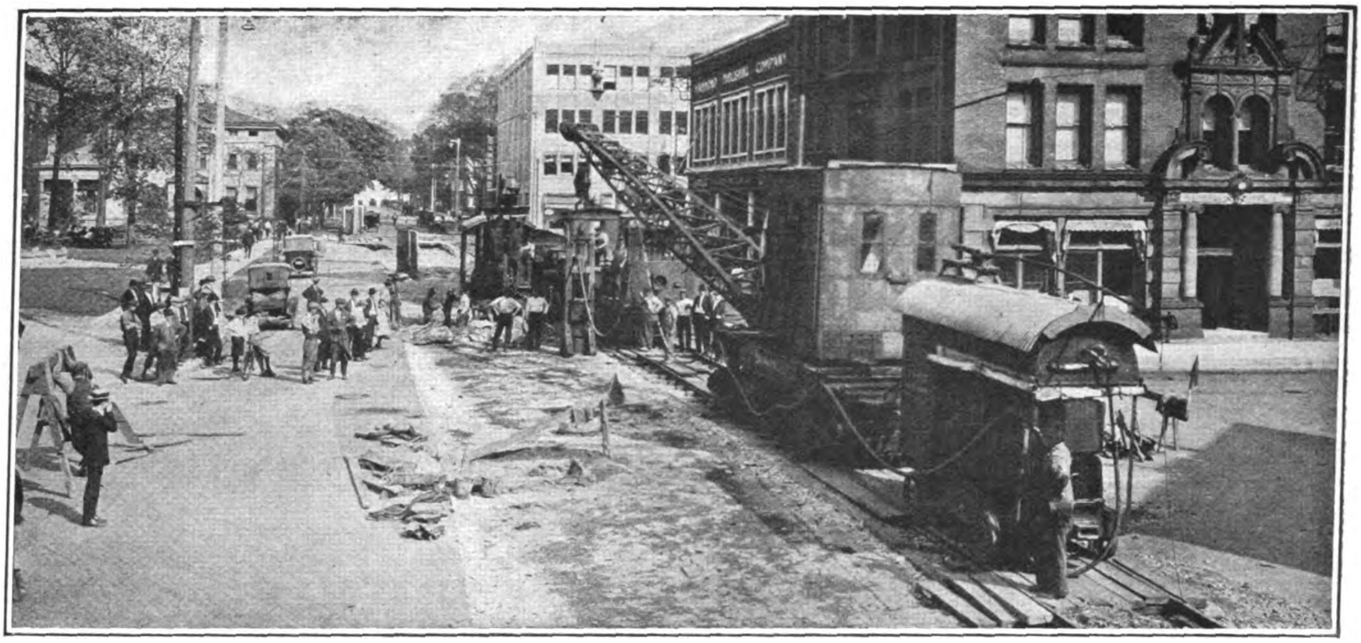
No. 37. A 1-ton Imperial hoist mounted on a swinging I-beam 8 ft. long. The boom swings from a center bearing on the door jamb.

No. 38. A chain hoist is used effectively for handling armatures to and from the racks in the shops of the Connecticut Company.

No. 39. Yale & Towne chain hoists used for raising car bodies in the shops of the United Railways & Electric Company of Baltimore.


38


39



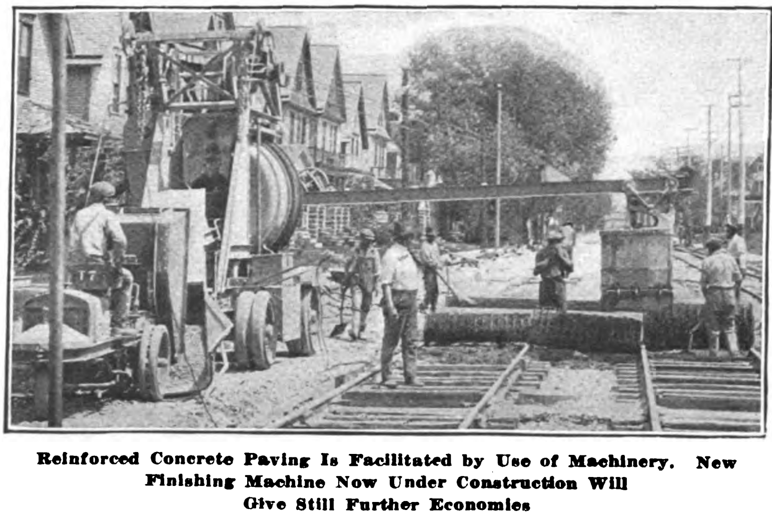
Large Air Compressor, Locomotive Crane, Air-Operated Pile Driver for Breaking Pavement, Work Car and Electric Shovel in Use in Reconstruction of Track on Oneida Street in the Center of Milwaukee

Keeping Track Machinery "on the Job"

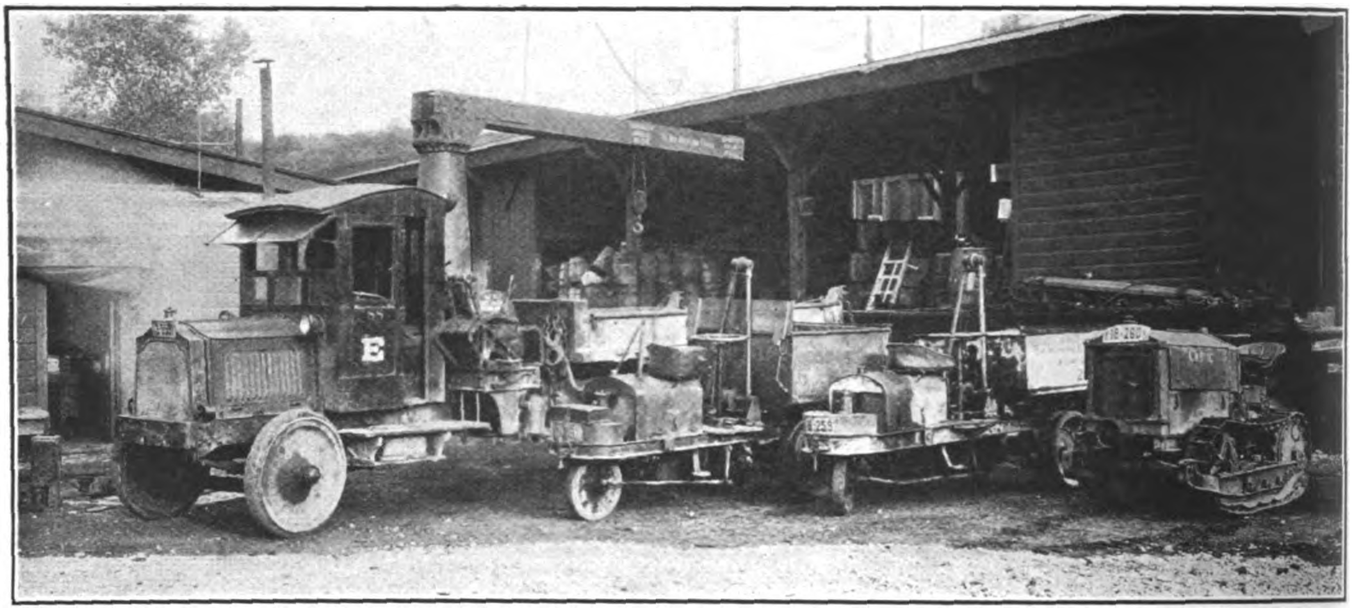
Track Maintenance and Reconstruction in Milwaukee Expedited by the Use of a Large Variety of Machine Equipment in Charge of a Special Division—Each Job Is Charged at Predetermined Rental Rates to Cover Equipment Costs

SUBSTITUTION of machines for hand labor has been a consistent policy of the way and structures department of the Milwaukee Electric Railway & Light Company. A large variety of machine equipment has been acquired under the supervision of R. H. Pinkley, engineer of way and structures, as a means for expediting track maintenance and reconstruction. Intensive study of the various kinds of work carried out by the department has also led to the construction of special machines and to the development of improvements in standard construction machinery to increase their utility in track reconstruction work. Whenever possible, manufacturers have been induced to make improvements in their apparatus according to the department's suggestions, but in some cases entirely new machinery has been developed and constructed by the railway. When the purchase of new equipment is contemplated the selection is made so as to obtain machines adaptable to as wide a range of jobs as possible. The variety of work which can be handled by a proposed new machine is carefully considered and an estimate is made of the probable hours of use per season. At the same time the estimated fixed charges and operating costs are weighed against the saving in labor to be expected. Thus the purchase of expensive machinery which can be used only at infrequent intervals for short periods of time is avoided.

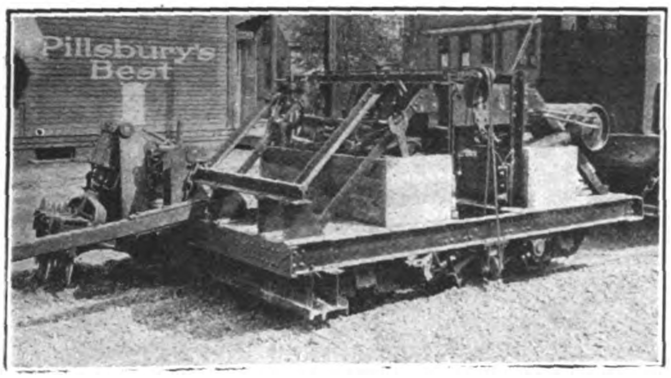
In addition to the care taken in the selection of new machinery, a consistent effort is made to secure maximum utilization of the equipment which is owned. As organization plays a large part in accomplishing this result, all machinery of the department is placed in direct charge of a special division, headed by a supervisor of equipment. The men of this division are carefully selected and are experienced in the operation, inspection and maintenance of the various machines used by the department. Machines are assigned to various jobs by the supervisor of equipment on request of the construction foremen. Trained operators are assigned to accompany each important machine. Each of these operators is responsible to the supervisor of equipment for the condition of his machine while on the job. On equipment which is kept in continuous service during the construction season, the operators are allowed an extra half hour morning and evening for inspection, cleaning and oiling. These trained mechanics take care



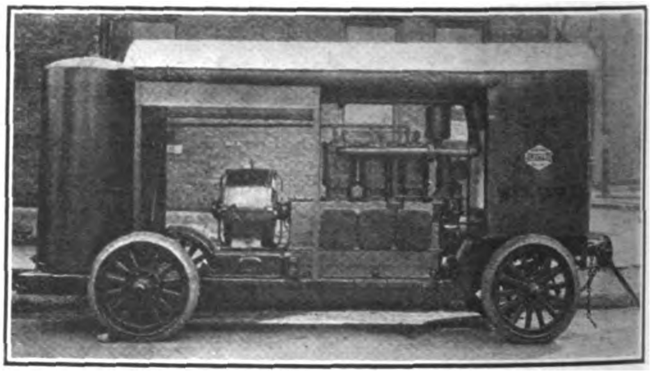
Reinforced Concrete Paving Is Facilitated by Use of Machinery. New Finishing Machine Now Under Construction Will Give Still Further Economies



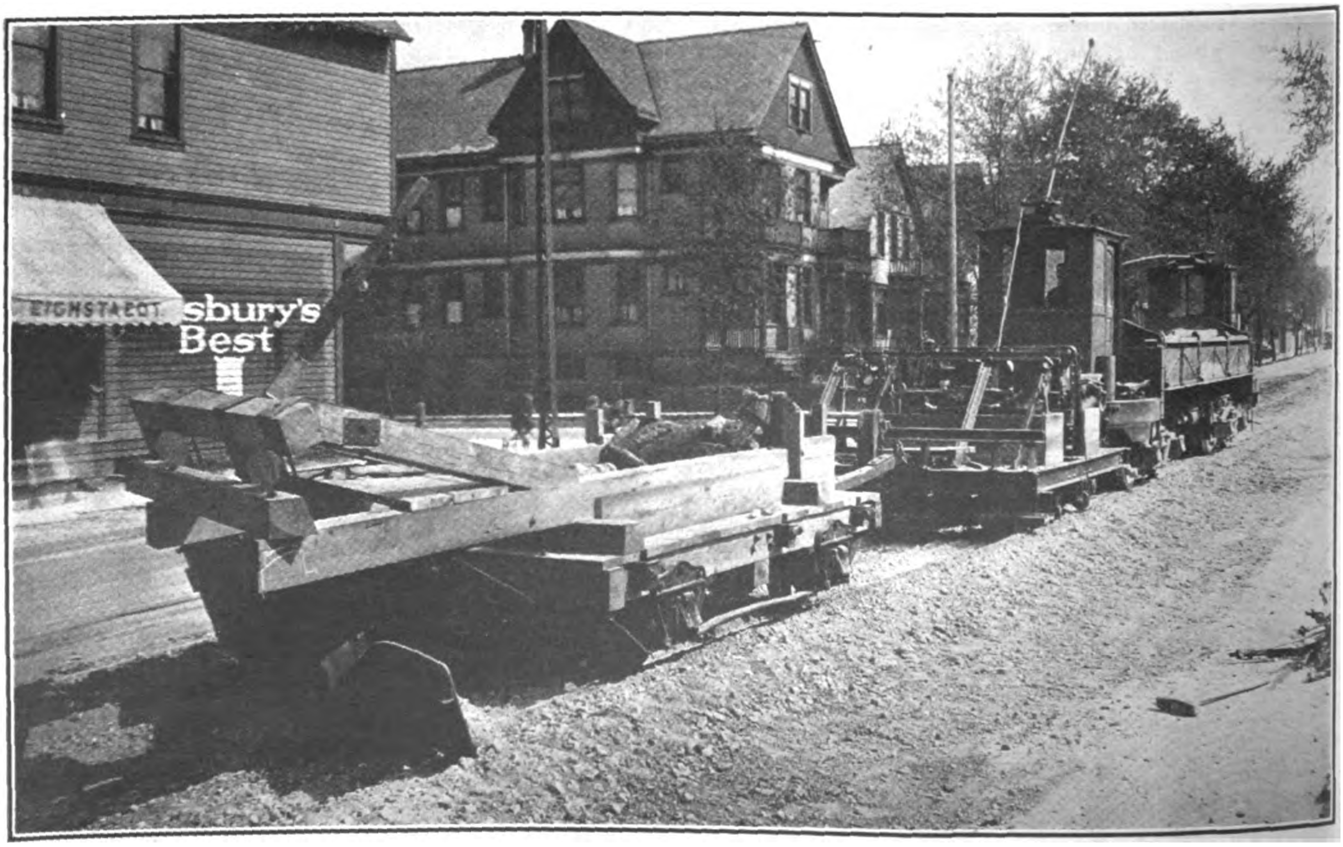
A Battery of Material-Handling Equipment Used by the Milwaukee Company in Trackwork



A Scarifier Built by T. M. E. R. & L. Co. Does Effective Work in Ripping Up Macadam Paving



Rubber Tires and Spring Mounting Cut Maintenance Costs on Equipment



The Scarifier Is Operated in a Train and Is Followed by a Scraper, Which Throws the Broken Paving to One Side of the Track of ordinary field repairs. In the event of a serious failure in the field additional mechanics are immediately assigned by the supervisor of equipment to transport repair parts and to aid in making repairs.

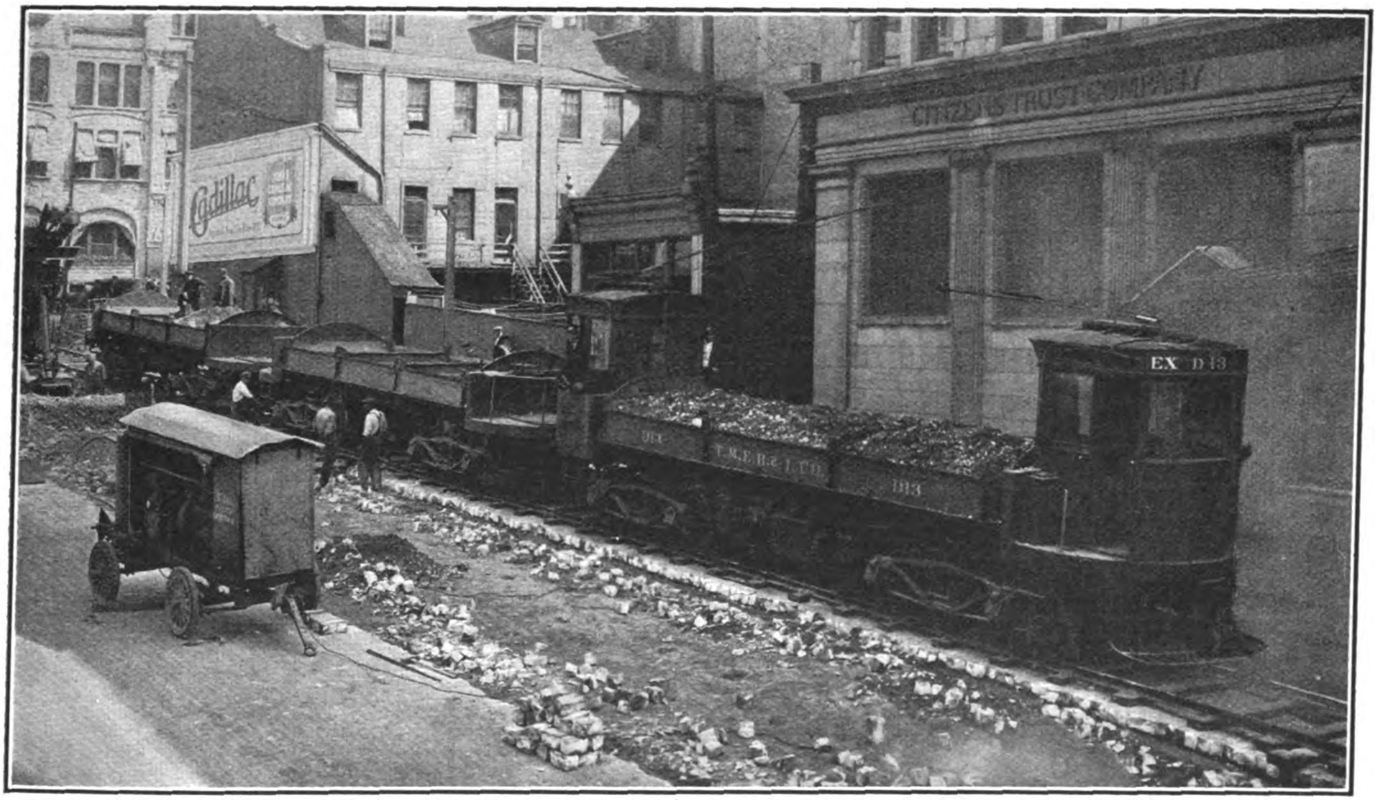
A carefully worked out system of accounting covers fixed charges and total operating costs of the way and structures equipment. The apportionment of the cost of each individual machine is calculated in the form of a rental charge which is made directly against the individual job on which the machine is used. This practice tends to stimulate the greatest possible utilization of existing equipment, as each job is charged with the day rate on the machines assigned to it until such time as they are released from the job by the construction foreman. This accounting method has an additional advantage in that it gives the true cost of any construction or reconstruction job, including all of the machine rental charges which would be made if the work were carried on by an independent contractor.

During winter months, when construction work is not in progress, the men of the equipment division are kept busy in the general inspection and overhaul of machinery belonging to the way and structures department. The number of men employed by this department varies between fifteen and twenty. Their work during the winter makes them intimately familiar with the design and construction of the various pieces of equipment which they are called upon to operate during the summer. They are particularly well fitted for taking care of emergency field repairs to their machines and to make frequent inspections so as to detect worn or weak parts before actual failure ties up the machine when it is required on a job.

A plan which was inaugurated during the winter of 1922-23 has been of additional value in impressing on the men of the department who handle its machinery the importance of proper care while this equipment is in the field. The various division foremen, equipment men and others in the way and structures department attended a school conducted under the direction of the general education department of the company. Instruction was given in some of the fundamental principles of mechanics and applied electrical practice. In addition, the importance of the proper maintenance and lubrication of track machinery was stressed. Damaged machines were used as examples to illustrate the effects of improper care. In view of the increasing use of machinery by the department it has been felt that this form of instruction is of immense value in impressing on employees the importance of proper care.

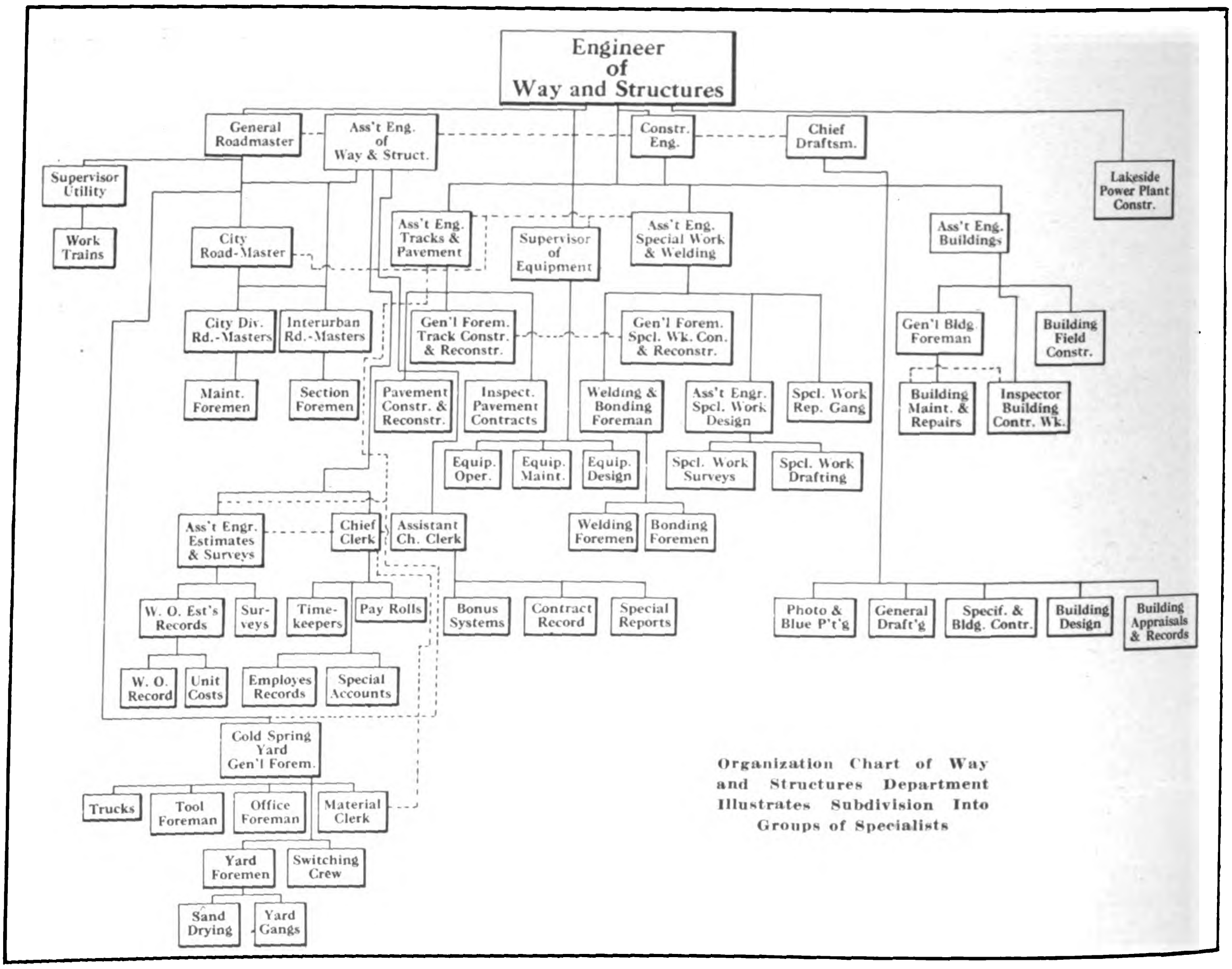
The supervisor of equipment and two of his assistants are provided with Ford roadsters equipped with wagon-box bodies and a supply of hand tools, so that during the construction season they are able to move rapidly between various jobs in order to take care of emergency repairs to equipment. When major shop repairs are required the work is done by regular shop forces, but in most cases one or more of the equipment specialists are assigned to the shop with the machine and supervise the repair work. The supervisor of equipment issues orders for such shop work and requisitions materials and parts that are required.

Various classes of work carried on by the way and structures department are handled by groups of specialists as far as possible. Each of these groups is headed by a supervisor, and the various groups of specialists take their place in any particular reconstruction job under the direction of a general foreman. Some of the more important classifications of work include the following: (1) Equipment; (2) bonding, welding and grinding; (3) special work repairs; (4) asphalt and bituminous pavement repairs; (5) concrete paving gang; (6) utility and work train service, under the head of a supervisor of utilities.



Differential Dump Cars Used in This Case to Haul Away from the Job Removed Paving Loaded by Electric Shovel

Similarly to the above classes of field forces, the staff forces of the department are subdivided into groups of specialists. Two of the more important of these groups are: (1) A civil engineering division, which does all survey work and civil engineering for the entire company, including the electrical properties; (2) a drafting division, which prepares all drawings for the department, designs special work layouts and special machines, prepares blue prints and photographs, and does all of the architectural work for the company. In addition to these, there is a building maintenance division and a building construction division. The maintenance of way forces are organized in territorial divisions, each headed by a division roadmaster. These include three city divisions and three interurban divisions. The general organization of the way and structures department is shown in the accompanying chart.


Engineer of Way and Structures
General Roadmaster
Ass't Eng. of Way & Struct.
Constr. Eng.
Chief Draftsm.
Lakeside Power Plant Constr.
Supervisor Utility
Work Trains
City Road-Master
Ass't Eng. Tracks & Pavement
Supervisor of Equipment
Ass't Eng. Special Work & Welding
Ass't Eng. Buildings
City Div. Rd.-Masters
Interurban Rd.-Masters
Gen'l Forem. Track Constr. & Reconstr.
Gen'l Forem. Spcl. Wk. Con. & Reconstr.
Gen'l Bldg. Foreman
Building Field Constr.
Maint. Foremen
Section Foremen
Pavement Constr. & Reconstr.
Inspect. Pavement Contracts
Welding & Bonding Foreman
Ass't Engr. Spcl. Work Design
Spcl. Work Rep. Gang
Building Maint. & Repairs
Inspector Building Contr. Wk.
Equip. Oper.
Equip. Maint.
Equip. Design
Spcl. Work Surveys
Spcl. Work Drafting
Ass't Engr. Estimates & Surveys
Chief Clerk
Assistant Ch. Clerk
Welding Foremen
Bonding Foremen
W. O. Est's Records
Sur-veys
Time-keepers
Pay Rolls
Bonus Systems
Contract Record
Special Reports
Photo & Blue P't'g
General Draft'g
Specif. & Bldg. Contr.
Building Design
Building Appraisals & Records
W. O. Record
Unit Costs
Employes Records
Special Accounts
Cold Spring Yard Gen'l Forem.
Trucks
Tool Foreman
Office Foreman
Material Clerk
Yard Foremen
Switching Crew
Sand Drying
Yard Gangs

Organization Chart of Way and Structures Department Illustrates Subdivision Into Groups of Specialists

Since pneumatic tools are used in trackwork to a very wide extent a full complement of portable air compressors is required. These include one compressor of 225-cu.ft. per minute capacity, three 150-cu.ft. compressors, six 110-cu.ft. compressors and two 90-cu.ft. machines used for small maintenance work. Most of the compressors used are of a slow-speed type, considerably heavier than higher speed compressors of the same capacity. The slower speed machines, it is claimed, are more substantial in their construction and give lower maintenance. Most of them are mounted on spring-suspension, rubber-tired trailers to reduce vibration while they are being hauled from job to job by means of motor trucks. The 225-cu.ft. machine and one of the 150-cu.ft. machines are mounted on flanged wheels for operation on railway track.

An interesting development has been made in connection with the method of cooling these compressors. It was felt that water cooling for track department equipment of this kind was a source of considerable trouble, particularly in early spring or late fall, when carelessness during a sudden cold snap might result in cracked water jackets. Instead of using water, the compressed air is passed through cooling coils to the reservoir and then is led back through the cylinder jacket chambers to act as a cooling agent. It is reported that this plan gives satisfactory results.

Concrete breakers, tie tampers, jack hammers and pneumatic drills form the largest group of track tools requiring compressed air supply. For breaking up old concrete paving, a steam-hammer type pile driver has been found very effective. This is mounted on two supporting skids and moved from spot to spot by means of a crane car, as shown in an accompanying illustration. It is operated by air instead of steam and is available for use not only in breaking concrete but also for driving piling on various construction jobs around the property.

Both air and electric track drills and spike drivers are used. Since the adoption of concrete for paving, it has been considered important to obtain a type of track drill capable of being used in very close quarters so as to limit the size of openings required in the concrete paving for making track repairs. To meet this requirement a new type of close-quarter mechanical-drive drill

TABLE I—ANNUAL MAINTENANCE AND FIXED CHARGES FOR TRACK EQUIPMENT IN PER CENT OF ORIGINAL COST, MILWAUKEE

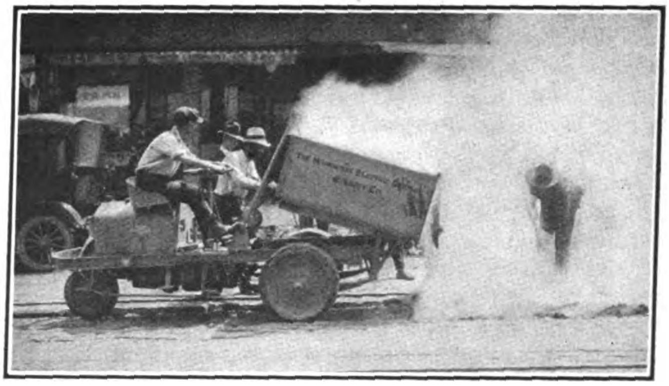
	Depreciation	Shop Repairs	Field Repairs	Storage and Incidentals	Insurance	Taxes	Total
Bonding machine	10½	6	10	3½	1	1	32
Air compressor, electric	12½	6	3	3½	1	1	24
Air compressor, gasoline	18½	6	7	3½	1	1	37½
Cement gun	7½	4	5	3½	1	1	22
Drill, electric track	10	5	10	3½	1	1	30½
Grinder	10½	5	10	3½	1	1	31
Hammers, air	15	5	5	3½	1	1	30½
Heater, tar and gravel	15	3	5	3½	1	1	28½
Hoist, electric	9½	5	3	3½	1	1	23
Loader, gasoline	15	10	6	3½	1	1	36½
Loader, electric snow	5	2	3	3½	1	1	15½
Mixer, electric	12½	12	4	3½	1	1	34
Mixer, gasoline	18½	13	8	3½	1	1	45½
Paint spray gun	10½	3	5	3½	1	1	24
Pump, gasoline	9½	2	4	3½	1	1	21
Roller	7½	5	3	3½	1	1	21
Saw, rail	7½	5	5	3½	1	1	23
Scarifier	12½	10	8	3½	1	1	36
Shovel, electric	10½	6	5	3½	1	1	27½
Signal, Nachod	7½	3	3	3½	1	1	19
Spike driver	5	3	4	3½	1	1	17½
Tampers, air	15	4	5	3½	1	1	29½
Trailer	9½	2	3	3½	1	1	20
Tractor, gas, wheeled	12½	9	5	3½	1	1	32
Tractor, caterpillar	15	15	10	3½	1	1	45½
Welding machine	10½	6	10	3½	1	1	32
Bucket, grab	10½	5	3	3½	1	1	24
Jim Crow	10½	2	3	3½	1	1	21

TABLE II—ESTIMATED ENERGY CONSUMPTION OF TRACK EQUIPMENT TO BE CHARGED AGAINST SPECIAL ACCOUNT FOR EACH DAY'S USE

Pieces of Equipment	Description	Hp. Motors Each	Kilowatt Capacity	Average Kw.-Hr. Daily
2	Bonding machine (Lincoln) 20 to 60 amp.	...	......	15.
2	Compressor, 150-ft	27	20.142	60.
3	Compressor, 110-ft	20	14.92	45.
2	Compressor, 90-ft	15	11.19	35.
1	Compressor, 10-ft. preheater	2	1.49	2.5
8	Drill, track—Duntley	1	0.74	2.
4	Drill, tie boring machine	½	0.373	1.
1	Drill, electric breast	1	0.746	0.5
2	Grinder, swing frame-shop built	3	2.238	5.
2	Grinder, Atlas rail	7½	5.595	14.
1	Grinder, Goldschmidt thermit	7½	5.595	15.
1	Grinder, Reciprocating rail	3½	2.611	6.
1	Grinder, Universal rotary	3½	2.611	6.
5	Grinder, Little Giant portable	1	0.746	2.
4	Grinder, flexible shaft	1½	1.119	2.
1	Hoist, P. & H. Co. 18 hp.	18	12.429	30.
2	Loader, B. & G. Co.	10	7.46	3.5
1	Mixer, Rex	15	11.19	20.
2	Mixer, Koehring, Nos. 14 and 14-E	15	11.19	15.
2	Mixer, Koehring, Nos. 6 and 14-E	7½ & 5	4.476	8.
1	Saw, rail, mounted on truck	1	0.746	2.
1	Scarifier—mounted on single-truck flat car	2	1.492	no power
2	Shovel, Thew electric	20	14.92	50.
1	Shovel, Thew electric caterpillar	20	14.92	50.
2	Signal, Nachod	...	......	......
6	Spike driver, Duntley Nos. 3 and 4	1	0.746	0.5
2	Welder, Lincoln Type W. 60 amp. and 35 amp.	...	......	30.
2	Welder, General Electric	7½	5.595	15.

TABLE III—DAILY RENTAL RATES ON WAY AND STRUCTURES EQUIPMENT

Description	Days Use per Year	Daily Rental Rate
Bucket, grab	50	$2.00
Buster, concrete	75	0.75
Compressor, electric air, 150-ft	150	6.75
Compressor, electric air, 110-ft	150	5.00
Compressor, electric air, 90-ft	150	4.00
Compressor, gasoline air, 90-ft	150	4.00
Drill, Duntley electric	250	0.60
Drill, Little David air	250	0.60
Drill, tie boring, electric	100	0.45
Drill, tie boring, air	150	0.30
Grinder, swing frame	175	1.35
Grinder, Atlas rail	175	2.25
Grinder, Goldschmidt thermit	175	3.50
Grinder, Reciprocating rail	175	4.50
Grinder, Universal rotary	175	3.25
Grinder, Little Giant portable	100	0.35
Grinder, Little David air	100	0.45
Hammer, (Air Jackhammers)	75	0.70
Heater, combination tar and gravel	100	4.00
Heater, three-burner surface	50	1.00
Jim Crow, hydraulic	50	1.50
Kettle, type D tar and asphalt	100	2.00
Loader, electric (snow work)	100	2.75
Loader, gasoline	150	8.50
Mixer, electric concrete, 21-E Rex	150	13.50
Mixer, electric concrete, 14-E Koehring	125	6.75
Mixer, electric concrete, No. 6-6 Koehring	100	6.75
Mixer, gasoline concrete, (½-bag)	125	2.25
Mixer, electric concrete, (1-bag)	100	3.00
Roller, steam	125	3.50
Roller, gasoline	125	3.25
Scarifier on single-truck flat car	100	10.80
Shovel, Thew electric rail	100	16.40
Shovel, Thew caterpillar	150	21.00
Spike driver, Duntley No. 3 and No. 4 elect	175	0.20
Tamper, Ingersoll-Rand air	50	1.00
Trailer, Lee four-wheel 3-ton	100	3.00
Tractor, Cleveland caterpillar	175	5.00
Tractor, three-wheel Clark	175	3.00
Welding machine, Lincoln and G. E.	175	3.25



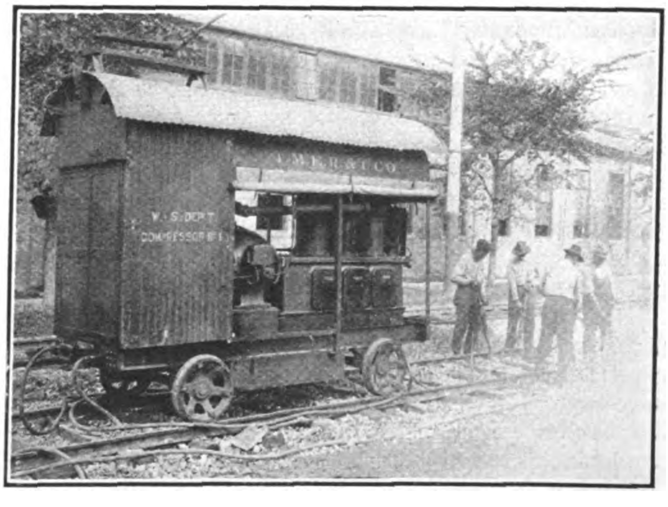
Hoist Dump Tractors Are Particularly Useful in Distributing Paving Material

has been developed and is being built in the company's shop. It is the intention to drive this drill by means of a flexible shaft from the motors on some of the rail grinders. All ties for tangent track are adzed and bored by machine in the material yard. A friction rail saw in the yard has also proved to be a considerable time and labor saver.

Several types of grinding equipments are utilized. Three Atlas rail grinders are used very largely to follow up top welding work such as that at cupped joints and special work repairs. A Goldschmidt grinder, in addition to its use for finishing thermit-welded joints, has been found particularly useful for grinding throatways in special work. In addition to this equipment, one reciprocating track grinder is used for removing rail corrugation and three specially designed and constructed portable swing frame grinders have been found particularly useful for roughing down thermit welds and for grinding the taper in special work throatways.

Considerable macadam and asphalt paving has been laid in the past. For tearing up macadam an air-controlled scarifier, shown in an accompanying illustration, has been found very effective. It consists of a heavily loaded trailer equipped with specially designed teeth that rip up the pavement. On asphalt a rugged knife clamped to the edge of a steam roller frame has been found to give very good results for cutting the pavement along a straight line at the edge of the track zone.

The scarifier is used in a train in which it is followed by a plow consisting of a heavy scraper mounted on a flat car. Following along behind the scarifier, this plow



Heavy-Duty, Slow-Speed Air Compressors Are Used for Field Work

forces the material cut loose by the scarifier over to the outside of the track. The train with scarifier and plow may be seen in an accompanying photograph.

The Milwaukee company designed this scarifier when it had occasion a couple of years ago to remove 85,000 sq.yd. of paving. It comprises a heavy steel frame supporting castings which carry the scarifier teeth. These are raised and lowered by compressed air. They are arranged so as to take in the entire track zone of a single track or one side of a double track up to the middle of the dummy strip. The teeth can be set down to cut 3 in. deep in one passing, and the scarifier is used to cut down into the paving surface from 3 in. to 7 in. when removing old macadam or other material in preparation for building a new asphalt surface, or in going down to the tops of the ties for installing concrete pavement.

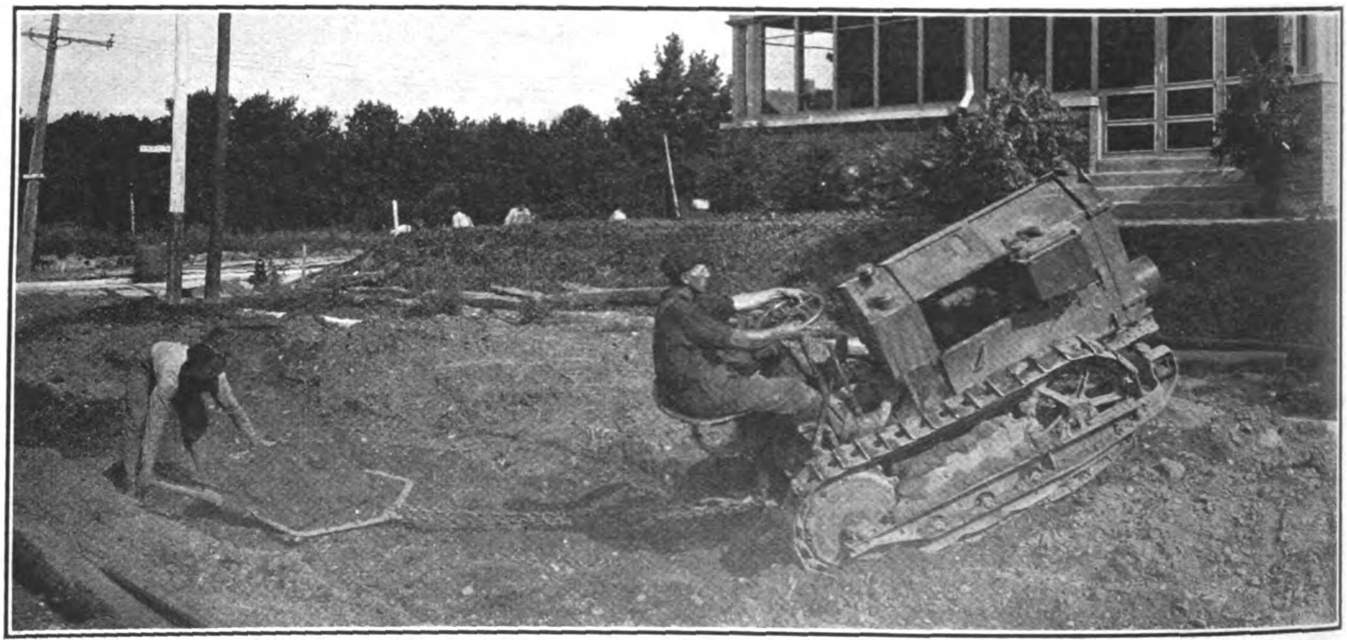
For handling the large quantities of heavy materials that are required in trackwork, a very complete group of equipment is available. A 3-ton derrick and a 15-ton electric drive Brownhoist locomotive crane with a 50-ft. boom are permanently located in the material yard for handling rails, ties and other heavy supplies. For construction work on the street a 15-ton Industrial derrick car, equipped with a 30-ft. boom and an extension boom for handling rails, is available. In addition, a 10-ton Brownhoist derrick car is used a great deal for handling heavy materials and in street construction work. It is equipped with a 30-ft. telescoping boom which can be extended to 45 ft. for handling rails. Three Thew electric shovels facilitate excavating work. One of these, equipped with a ⅝-cu.yd. bucket, is used for loading gravel at the company's own gravel pit, and two others, equipped with ¾-yd. buckets, are used in street construction work. One of the latter is mounted on flanged railway wheels and the other is equipped with caterpillar treads so that it can easily be manipulated around construction work. Two Cletrac caterpillar tractors have been found particularly serviceable for miscellaneous hauling. Equipped with snow plows, they are also available in the winter for clearing yards or other places not readily handled by the regular rail snow equipment.

Three-wheel Clark truck tractors with 1-yd. dump bodies are used in connection with concrete paving and also for handling materials used in construction work. Three of these have gravity dump bodies and on the remaining two the bodies are of the hoist dump type so that the load can be discharged as desired. An additional four-wheel tractor of 1-ton capacity with a gravity dump body has been found useful for opening and closing gangs on miscellaneous track repair work.

Several types and sizes of paving rollers are utilized. These include one 10-ton gasoline roller and two 7-ton rollers. One of the 7-ton machines is steam driven, while the second has been converted to electric drive and is operated by means of a cable mounted on a drum which takes up the slack as the roller is moved back and forth. An additional 5-ton Galion gasoline tandem roller is used in connection with asphalt repair work.

Extensive use of concrete has led to the adoption of a variety of mixers and paving machines together with material loaders for meeting the requirements of different types of jobs. A Rex chain belt 21-E mixer mounted on rubber tires is used for large paving reconstruction jobs. For large special work construction a No. 14 mixer equipped with a 20-ft. boom and distributor bucket gives good results. This machine is mounted on steel-tired wheels which are so arranged that flanged rims can be bolted on for operation on the track rails to reach all parts of the street opening. Two No. 6 Koehring pavers are particularly useful for small special work jobs and grouting work. Barber-Greene bucket loaders with measuring hoppers facilitate the work of handling gravel, sand and similar materials. A complete equipment of dump cars is used to transport paving and other materials. This consists of 7 Differential dump motor cars and 18 Differential trailers, one of which is the door chute type, together with six 20-yd. center dump, steel Koppel cars.

A new cement skip has just been developed for dumping a four-bag load into a Clark tractor so as to avoid tying up the tractor while individual bags are being emptied. A concrete finishing machine is also being completed in the railway company's shop and is designed to meet the special requirements of track zone paving.



The Tractor Speeds Up Grading and It Will Go Anywhere

Rubber-tired equipment is used wherever possible, as it has been found that the hauling of heavy machinery over pavements by motor vehicles results in severe vibration and shock. The saving in maintenance which is obtained by applying rubber-tired wheels and spring suspension gives a substantial reduction in the wear and tear on equipment.

HOW MACHINE COSTS ARE ACCOUNTED FOR

The distribution of machine costs to various construction jobs on a rental basis, as mentioned earlier in this article, is accomplished by a simple accounting system which includes all of the various items of maintenance, operating cost and fixed charges. This was worked out after a detailed study of the subject was made by the way and structures department.

The former practice was to charge the cost of supplies and maintenance of the equipment into an annual tool work order which was cleared out annually to the various construction jobs in proportion to the pay-roll costs. This method provided no way of equitably distributing fixed charges on the equipment.

Under the new arrangement, fixed charges, depreciation, insurance and taxes, together with maintenance and operating costs, are all accumulated in a special account. Table I shows the rate of depreciation used for various types of equipment. The operating charges to the special account are divided into four general subdivisions as follows: (1) Miscellaneous supplies and expenses, including oil, grease, gasoline, waste and other materials and supplies used in the operation of the equipment; (2) power cost, based on the daily use of each machine; (3) maintenance of equipment, including repair parts, labor and sundries, but not general replacements or renewals of equipment; (4) maintenance of equipment buildings, fixtures and grounds, including all charges against buildings devoted exclusively to the storage of equipment used by the way and structures department.

Using the estimated number of days use per year as a basis, the total fixed charges, maintenance and operating costs for the various pieces of equipment as shown in Tables I and II have been compiled for each class of equipment to give a daily rental rate. From reports made by field men to the accounting department, each construction job is charged with all equipment on that particular job. As these charges are made, the general equipment special account is credited with corresponding amounts, so that at the end of the year the total annual cost of the equipment has been charged out against the individual jobs on which it was used. Minor adjustments in the estimated rental rates are made when required, so that the various charges balance with the special account at the end of each year.

Line Practices on Pittsburgh Railways

The Materials, Construction and Equipment Used by This Large City System, Together with the Maintenance and Emergency Organization Employed, Are Briefly and Helpfully Discussed — Recent Storm Tests Merit of Line Department's Work

By H. A. Pharo

Superintendent of Lines Pittsburgh Railways Company

THE Pittsburgh Railways Company, like many other large systems, is composed of several smaller properties which have been combined under one ownership and management. While under independent operation these companies had constructed their lines according to individual ideas. When the combination was effected, it was naturally expedient that methods of construction and materials be made uniform for the entire system.

A department of lines was organized under a superintendent and the system divided into eight districts or divisions with a line foreman in charge of each division. The personnel of each division are classified as linemen, emergency men, line helpers, emergency helpers, bonders, groundmen and drivers according to the character of their work. Each division has its own complement of tower vehicles and line cars, proportioned in number to the mileage of lines to be maintained over paving or T-rail trackage on private rights-of-way.

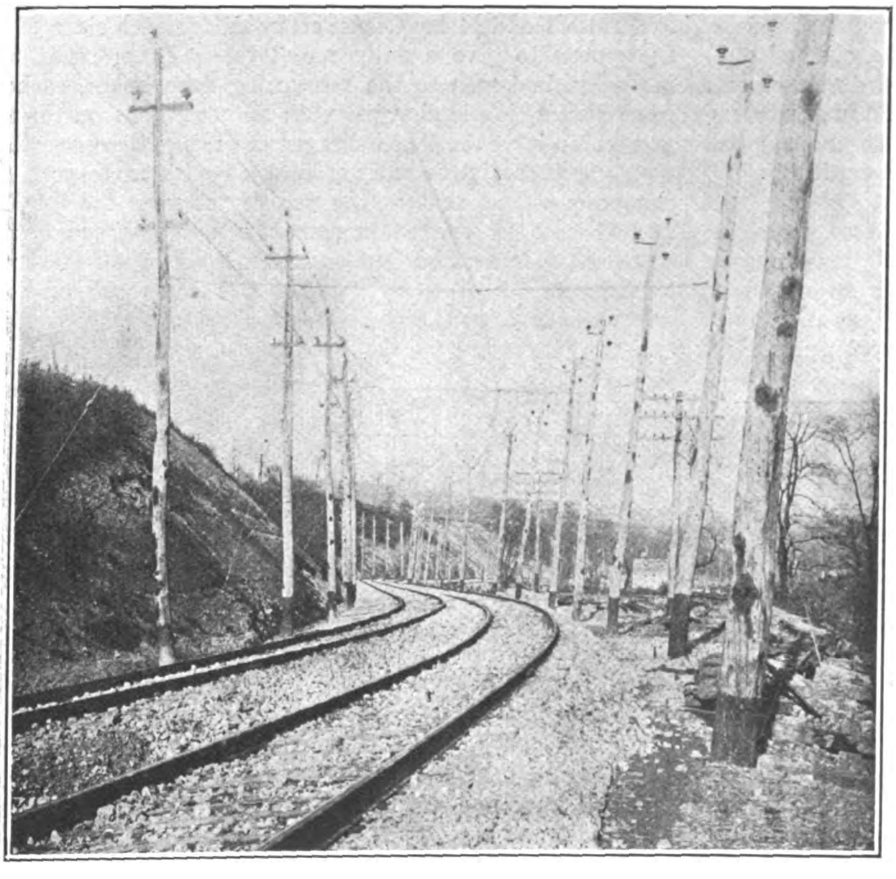
The duties of the department were originally confined to line construction and maintenance, but the passing years have broadened its scope until at the present time it is correlated more or less with the activities of all other operating departments. Some of the various responsibilities will be referred to in the succeeding paragraphs.

Line maintenance seems to be a more or less prosaic subject and does not generally arouse the enthusiastic interest accorded descriptions of smooth track, carefully planned carhouses, resplendent rolling stock and architecturally beautiful substations. To the busy street railway man the lines are a necessary adjunct to the business of transportation for the purpose of delivering motive power, but something often to be ignored until there is a service interruption due to a trolley break or similar cause.

The layman sometimes views the lines as a combination of poles and wires which he reluctantly admits must be tolerated. Said layman is prepared at all times, however, to advance unlimited arguments that a pole could be more advantageously located on his neighbor's frontage, rather than on his own, or that it is perfectly reasonable to request a 50-ft. move to clear an 8-ft. driveway to his new garage, when a few feet would suffice.

The Pittsburgh district, with its narrow streets, steep grades and sharp curves, presents the maximum difficulties for the successful operation of an electric street and interurban railway system. It is probably true that the line construction of the Pittsburgh Railways Company's system is not essentially different from that of other large systems, nor does the writer wish to convey the impression that radical departures have been made from existing practices.

The department of lines has its problems due to the topography and atmospheric conditions of this district, and that some of them have been solved is evidenced by the record of February 19 and 20 this year. On that night the most severe sleet storm in local history visited the Pittsburgh district. With a total of 1,500 miles of trolley, feeder transmission, signal and other wires only eighteen breaks occurred. Six of these breaks were caused by sleet cutters and the balance by ice incrusted trees and foreign circuits, which by reason of their weighted condition were unable to withstand the violence of the high wind. There was not a pole broken nor disturbed, nor even a case of "hot" pole, and cars were kept in continuous operation on all routes in order to break the coating of ice on the trolley wires. Since all day runs were started out on schedule time in the morning the department of lines is naturally inclined to be proud of this record and considers that its efforts have not been in vain.



Typical Wood Pole Construction on Private Right-of-Way, Showing High-Tension, Feeder and Span Construction on the Same Pole Line

In maintaining the lines of the system it has been found that best results can only be obtained by constant inspection and repair. Every mile of line construction is inspected thoroughly and repaired or adjusted if necessary once each week. Where headways are close and wear is consequently greater, inspections are made at more frequent intervals. The old proverb that an "ounce of prevention is worth a pound of cure" applies admirably to the upkeep of lines. Minor repairs and adjustments made promptly when distress first appears save large expenditures which would later become necessary if the small faults were neglected.

Trolley inspection and repair are carried on by the familiar tower vehicle. Both tower trucks and horse drawn tower wagons are in use at the present time, but a complete motorizing program is well under way, and in a brief time trucks will be used exclusively.

A tower crew consists of lineman, helper and driver, and each crew is assigned a district for which it is responsible. By constant association daily, except Sundays and holidays, the lineman becomes intimately familiar with all the peculiarities of his district and is thus able to render more efficient service.

Pole and feeder inspection and repair are carried on by special crews on each division. This branch of work, classed as heavy, requires a force of men equal to the average requirements and the tool equipment corresponds to the nature of the work. Work of this class is carried on under the direction of the head lineman or assistant division foreman and line cars are generally used for transporting men and tools.

A total of twelve tower trucks and wagons and six line cars are required to care for the maintenance and construction of lines and other departmental activities.

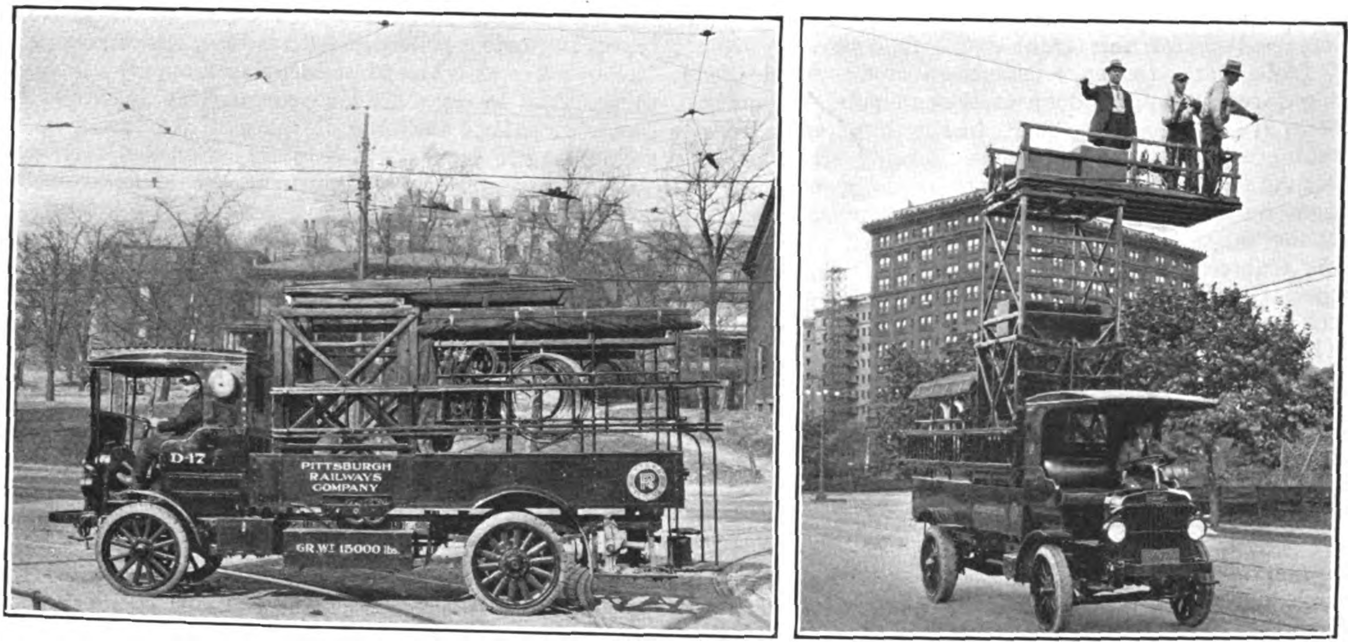
The slogan of the Pittsburgh Railways Company is "Safety Always" and the safety movement pervades the entire organization of the lines department. Each truck, wagon and line car is equipped with only the best tools obtainable and in ample assortment, including rubber boots, coats, hats, gloves and safety blankets.

EMERGENCY CREW WORK AND EQUIPMENT

Located within the area of heaviest traffic are six emergency stations of the line department, at each of which a crew, consisting of two men, is always on duty during the twenty-four hours. The duties of the emergency men are manifold as their title implies. They are prepared to handle troubles of any description which are causing traffic interruption, or may interfere with regular car movement. When the emergency service was first established wagons drawn by two horses were employed to transport men and tools. Later, light motor trucks were substituted. Recently all the light trucks have been replaced with a fleet of Autocar 3-ton trucks. In designing the bodies of the present trucks the experience of preceding years was the guide, with the idea of producing a vehicle that would meet all requirements as nearly as possible.

Mounted on each truck is a Trenton three-section tower, which enables all elevated work to be carried on with freedom and safety. Especial attention was given to the provision of space for tools and materials to meet every requirement. In the case of personal injury the emergency men are prepared to give first aid, and each truck carries a complement of stretchers, woolen blankets, rubber blankets and air pillows for the proper handling of cases requiring surgical attention.

The emergency men report to the foreman of the division where they are located, but their work is not confined to any particular area. The crew which is available nearest the source of the call is dispatched. In case of fires the load dispatcher, by means of a con-



Latest Type Tower Truck Placed in Service by Pittsburgh Railways. Gross Weight of 15,000 Lb. Is Marked on the Truck to Comply with the State Law. The Actual Gross Weight, Including Two Men, Was Found to Be 11,325 Lb.

nection to the fire alarm system, learns the location and at once notifies an emergency crew to investigate. On arriving, the emergency men telephone the load dispatcher as to the probabilities of power or traffic interruption, and remain at the scene to furnish further information, assist in rerouting of traffic, or care for any lines which may be endangered or damaged.

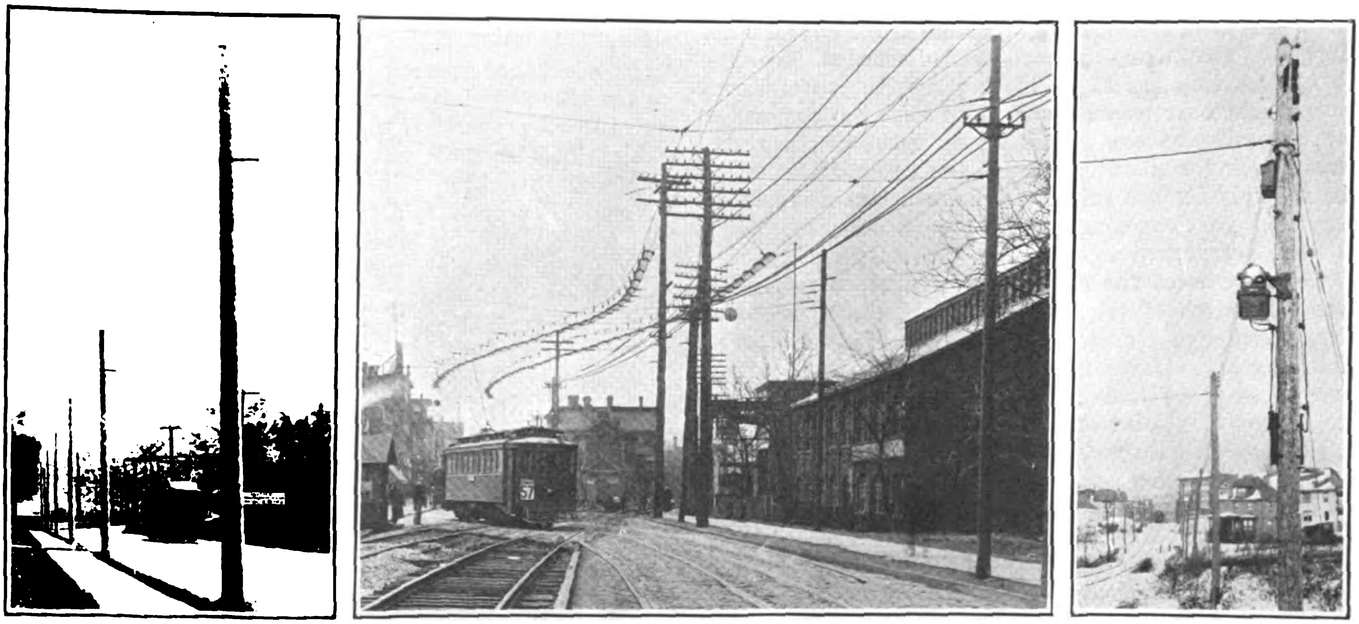
On holidays when traffic is heavy the regular emergency service is augumented by additional crews located at strategic points. These extra crews are composed of linemen, qualified by many years of street railway service. Line cars are usually the means of transportation for the extra service, since the regular equipment of tools will meet practically any demand.

Regular emergency service is not maintained on the interurban routes, but the residence of the men and the work schedule of these divisions is so arranged that men competent to handle high-tension lines, signals and other facilities peculiar to high speed routes are available on short notice.

The management of the Pittsburgh Railways Company has always been progressive and liberal to the extent of its resources. As a result the department of lines has been free to carry on experiments with various classes of materials and devices, and within reasonable limits to modify methods of construction in order to determine what is best adapted to the system as a whole.

Hard drawn trolley wire is standard, but on account of the increasing interest in high strength alloy wires, tests of such wires are being conducted on each division on routes where operating conditions are severe.

Rigid trolley construction prevails over the entire system, years of demonstration having shown this type to be best adapted to local conditions. Inasmuch as but few cases of crystallization are reported, it would



Left—Concrete Pole Installation at Charleroi, Pa., Pittsburgh Railways. Center—A Particularly Helpful Installation of National Trolley Guard on a Reverse Curve Crossing with the B. & O. R.R. on Second Avenue, Pittsburgh. Right—Typical Automatic Signal Installation of the Pittsburgh Railways. This Particular Installation Is on the Beachview Route

seem that possibly rigid construction is a remedy to some extent for this troublesome tendency.

Trolley and feeder construction along paved thoroughfares is supported on steel span poles. Standard poles are three section, 30 ft. in length, of extra heavy tubing and provided with a reinforcing sleeve at the ground line. The section lengths are of special proportions in order to furnish a maximum amount of space in the top section. Several sizes are used according to the requirements of single line, double line, curves or special work. All steel span poles are set 6 ft. below curb grade, in concrete, and keyed with blockstone. The rake is uniformly at the ratio of 12 in. in 24 ft.

In passing, it is perhaps not amiss to cite the advantage of utilizing trolley span poles for street lighting. A notable program of "white way" lighting has already been carried out by the city of Pittsburgh and surrounding boroughs. The Duquesne Light Company has in all cases suspended its lights from ornamental brackets attached to the tops of span poles.

Long and irregular spacing of poles is avoided as far as possible. On straight line a spacing of 100 ft. is considered the limit, and by careful survey it is generally possible to confine the spacing to this distance with a tolerance of a few feet to reach a property line. For curve and special work construction, poles are spaced and located in relation to the requirements.

On private rights-of-way, wood poles are used exclusively for supporting trolley, feeder, transmission and other lines. All wood poles are head guyed to reduce stresses at the butts, thereby very materially increasing the life of the poles. Realizing the increasing scarcity of sound, symmetrical wood poles, the corresponding increase in price, and the necessity for a substitute, several important sections of line have been reconstructed on tubular, reinforced concrete poles, such as pictured herewith.

TROLLEY WIRE HEIGHT MAINTAINED AT 20 FT.

Trolley wires are maintained at a uniform height of 20 ft. above street grade as far as possible, except where passing under bridges and viaducts. Brailing is used on both the outside and inside of all curves, enabling trolley wires to be held in rigid alignment to the curvature of the track. All branch trolley wires are dead ended after passing through frogs but all other forms of strain guying have been discarded.

All line ears are 15 in. in length, with cap and cone suspension over paved track and round top suspension over T-rail trackage. Wood strain insulators are used exclusively for all trolley spans, their reliability having been amply demonstrated. Both wood strain insulators and caps and cones are painted once annually with a special preservative.

On account of the many short radius curves, which are a product of the narrow thoroughfares, a rather large assortment of trolley frogs of different degrees is necessary. Both malleable iron and bronze frogs are in use. Malleable iron, sherardized, has been found to be very satisfactory for frogs and for solid and adjustable crossings, both from the standpoint of first cost and from service.

Feeders throughout the system are supported aërially on the span poles. On steel poles, malleable iron crossarms, of a design originated by the line department to meet the requirements for supporting heavy feeders without being unsightly in appearance, are used. Feeder pins and insulators are of special design to meet local conditions.

Where street railway tracks cross steam railroad tracks at grade a trolley guard has been erected over the trolley wires as a means of insuring a supply of power to the cars in case of dewirement. To increase the factor of safety, the zone of the guarded trolley is of ample length to cover a two-car train both on the approaching and leaving sides of the steam railroad tracks. Special pole layouts were designed to support the increased weight of the crossing guards in order that the trolley wires could be easily maintained at the proper elevation.

The Pittsburgh Railways Company has always favored electric switch throwing devices and 115 of them are in operation at the present time. Like all other pieces of apparatus containing moving parts, electric switches must be properly maintained, preferably by men understanding both the electrical and mechanical features. The department of lines follows this practice, and on one particular division where many electric switches are involved one man confines his duties solely to this work, making rounds of inspection daily with a Ford roadster equipped with delivery body for transporting tools and repair parts.

Non-clearance curves, which cannot always be avoided where double tracks are laid on narrow streets, are equipped with automatic, trolley contact, block signals of Nachod design. These signals permit single train movements only and eliminate the delays and dangers due to backing should two trains reach the curve at the same time. Train movements over single track are governed by Nachod automatic block signals of the closed circuit type, permitting following movements.

Signal apparatus is under the direct supervision of the division foreman, assisted by certain linemen familiar with the circuits.

Since the track is the other side of the street railway power circuit the bonding of track has been given special attention. To obtain the best results certain men confine their activities to bonding and are competent to apply both compressed and arc weld bonds. Maximum conductivity of joints can only be secured by careful application of the bonds and the necessary tools have been carefully selected to achieve this result. Labor saving electric motor driven tools are used for drilling, reaming and grinding.

In conclusion, permit a brief retrospect to former years, when the large electric railway systems of today were small properties, when lines were constructed and maintained by those nomadic functionaries collectively referred to as the "line gang"—may their tribe increase. For be it said to their everlasting credit, the old time "line gang" with meager equipment of tools and crude materials not only constructed and maintained creditable lines but established the basic principles upon which modern line construction is founded.

Publicity Slips Accompany Checks

THE Olean, Bradford & Salamanca Railway pays all its employees, and other creditors, by check. To emphasize the fact that the money to make these payments comes from the railway patrons, slips have recently been attached to all outgoing checks. The slip reads:

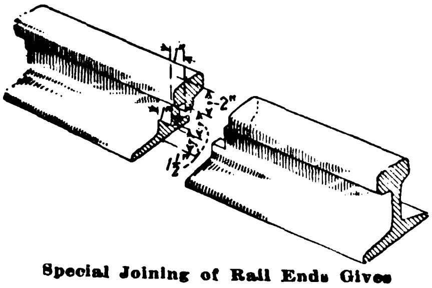
"It is the people who ride on our cars who make advertisements that are being published in the local newspaper."

Equipment Maintenance Notes

Mitered Joint in T-Rail Has Great Strength

IN AN effort to devise a rail joint of the ordinary bolted type having greater strength than the ordinary joint, the Union Street Railway, New Bedford, some time ago constructed a mitered joint for use in open track. The rail used for the experiment was 5-in. T. It was cut vertically and horizontally as shown in the accompanying sketch. The end of another rail was cut to correspond.

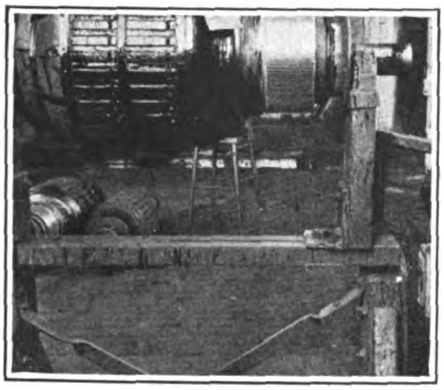
After thus mitering the ends of two rails, the joint plates were left entirely loose to see what strength the joint would develop. This joint has now been under comparatively heavy traffic for two years and has stood up in excellent shape. During this entire time the joint plates have been left loose. It is felt by the railway that such joints possess much greater strength than the ordinary straight vertical joint, but that the cost of cutting is too great to make its use practicable except under unusual conditions.



Special Joining of Rail Ends Gives High Strength

Adjustable Winding Rack

THE winding of armatures is facilitated considerably in the Junction Park shops of the Beaver Valley Traction Company, New Brighton, Pa., by the use of the adjustable rack illustrated herewith. The base of the rack has four legs with cross braces of steel strap. Upon this is mounted a 4-in. steel channel with the groove fitting over the base. This channel has a groove slotted longitudinally for about half its length. On this is mounted the adjustable support for one end of the armature shaft, held by a follower and through bolt. The angle on the upright is machined with an offset so that it fits into the slot and holds the bracket in line. A slight turn on the nut releases the bracket so that it may be shifted to another position. The opposite support is fixed.



This Rack Is Adjustable for Various Lengths of Armatures

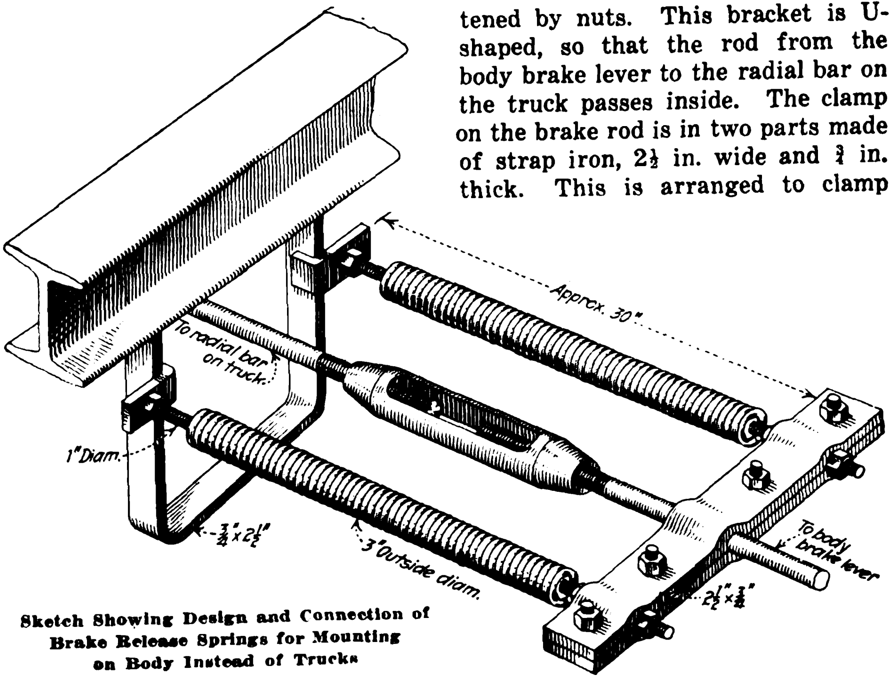
For winding compressor armatures which are too short to fit in the rack in the ordinary manner a sleeve bearing is attached to the upright and the armature shaft inserted in it.

Release Springs Connected in Body Brake Rigging

THE Philadelphia & Western Railway, Norristown, Pa., is using a special arrangement of the brake release springs on its cars. The springs are connected at one end to the rod running from the body brake lever to the radial bar on the truck. At the other end they are attached to a special support on the body underframe. The brake release springs on the trucks have been done away with, also various supporting parts, which lightens the truck considerably. At the same time the new arrangement of brake release springs insures that the shoes will remain free of the wheels and thus increase their life and reduce energy consumption.

The arrangement as shown in the accompanying illustration consists of two large tension springs. These are 3-in. outside diameter and have a nut screwed into either end, the thread on the nut being arranged so as to screw into the turns of the spring. Rods threading in these nuts at opposite ends of the springs are attached to a permanent bracket on the car body underframe and to a clamp on the rod running between the body brake lever and the radial bar of the truck. The rods used to connect the ends of the springs to their supports are 1 in. in diameter.

The bracket which forms the permanent attachment for the springs is made of ¾-in. x 2½-in. strap iron and has two supporting clamps to which the rods from the springs are fastened by nuts. This bracket is U-shaped, so that the rod from the body brake lever to the radial bar on the truck passes inside. The clamp on the brake rod is in two parts made of strap iron, 2½ in. wide and ¾ in. thick. This is arranged to clamp

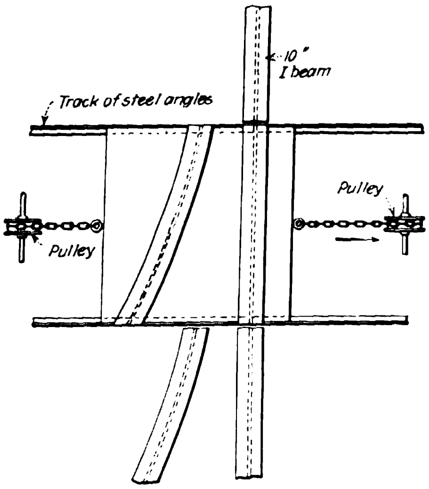


Sketch Showing Design and Connection of Brake Release Springs for Mounting on Body Instead of Trucks firmly on the brake rod and also has provisions for clamping the two rods which lead to the release springs. Further fastening is also provided by nuts on the end of the rods.

By this installation the release spring equipment is placed up away from wheel wash and mud, so that its operation is not so likely to be affected by weather conditions. Strong springs can also be used and efficient release of the brakes assured. This construction has been in successful use several years.

Overhead Monorail Switch

HEAVY material is moved from place to place in the shops of the Worcester Consolidated Street Railway, Worcester, Mass., by means of an overhead monorail system. The track is made of 10-in. I-beams from which are suspended rolling chain hoists. The main track runs through the entire shop and branch tracks lead off to various places, such as the welding rooms, where special operations are performed. To accomplish the switching from the main track to a branch, an unusual overhead track switch is used. A gap is cut in the overhead rail sufficient to allow the insertion of a rectangular frame that carries two short pieces of 10-in. I-beam, similar to that used for the main track. One of these is straight to bridge the gap in the straight track, and alongside of it the other which is curved with the correct radius to connect the straight track with the curved track. The frame rolls transversely on a track composed of steel angles. This track is slightly depressed to lock the switch into position. The switch may be thrown from the shop floor by chains fastened to the frame and running over a pair of pulleys.



The Square Frame Moves on a Track Made of Angle Irons, When This Monorail Track Switch Is Thrown

Dick Prescott Delivers Material

And Sees an Opportunity

"DICK," said Steve White, the carpenter foreman, late in the morning of Dick Prescott's second day as a carpenter's helper in the Consolidated Railway & Light Company's shop, "run over and see if old man Johnson has those vestibule belt rails ready for us. We've got to get this car out, and our time is getting pretty short."

Accordingly, Dick immediately went over to the mill. On the previous day he had seen Steve White make a rough pencil sketch and heard him tell the shop clerk to have six pieces made up in the mill in accordance with the dimensions shown. He had not, however, heard the careless boy actually transmit a verbal order to make four pieces instead of the number required. Approaching old man Johnson, who was busily engaged at the shaper, Dick asked, "Have you finished the six belt rails that were ordered yesterday?"

"Sax rails, what you mean?" queried Johnson.

"Why, George ordered six rails made yesterday for this car that has to go out in a hurry."

"Sax nothing! Dat kid only say four pieces an' I doan' mak no sax! Der's four over on dat table an' you ken tak' 'em over. Let some'on else worry!"

Well, I'm sure I heard Mr. White tell George to get six pieces made, but I'll take these right over, as there has evidently been some error."

"Er'er yes—that's ever' day in dis shop. No order, no drawin', no system, nothing! Ever'thing last minute—hurry up! Hurry up! Half d' stuff ban wrong. Believe me, I lak t' have all good lumber we spoil! Tak' 'em on over, dis shop mak' me sick!"

After delivering himself of this tirade, Johnson turned on his heel and walked away, while Dick piled the four finished rails on his arm and started back for the carpenter shop.

Steve White was again busy at his little desk, this time listing in a requisition book a long string of parts which he had discovered were out of stock.

Dick looked in the door of the office and said, "Johnson only made up four of these rails, Mr. White; I thought I heard you say yesterday that you needed six."

"What!" exclaimed White. Then turning to the boy at the time window, "George, how many of these rails did you order yesterday?"

"Why, I'm not sure, Johnson seemed to know how many to make."

"Good Lord! What's the matter with your ears? Get over there and tell Johnson to make up two more pieces right away!"

As the boy slouched out the door, White turned to Dick as though thinking aloud. "We're sure out of luck now. Can't possibly get that car out today. Suppose old Johnson has his machines set up for something else by this time."

Dick, who had been thinking rapidly, hesitated a moment and then deciding to take advantage of the opportunity, spoke up.

"Mr. White, I've done drafting work in several shops during my summer vacations and I wonder if I couldn't be of help to you right here in the office. We could set up a drawing board over there in the corner, and I could do some of this detail work of making sketches, chasing up material and other things that would give you more time in the shop."

"Well, I don't know. I've talked to the old man about putting on a man for that kind of work, but he won't listen. Says this shop has got along all right for thirty years and he don't see no reason getting loaded up with a lot of red tape now. It would sure be a big help—"

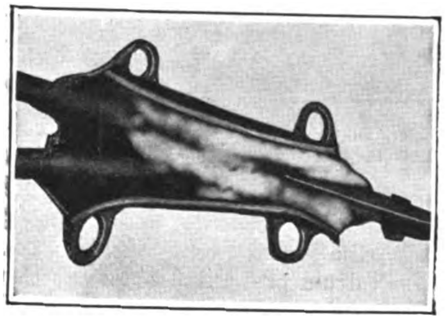
Just then the telephone interrupted and White picked up the receiver.

"That you Steve?" said Thomas Mullaney's gruff voice. "How's that car coming along? The transportation department wants to know when to send for it."

(To be continued next month)

Overhead Frogs Reclaimed by Welding

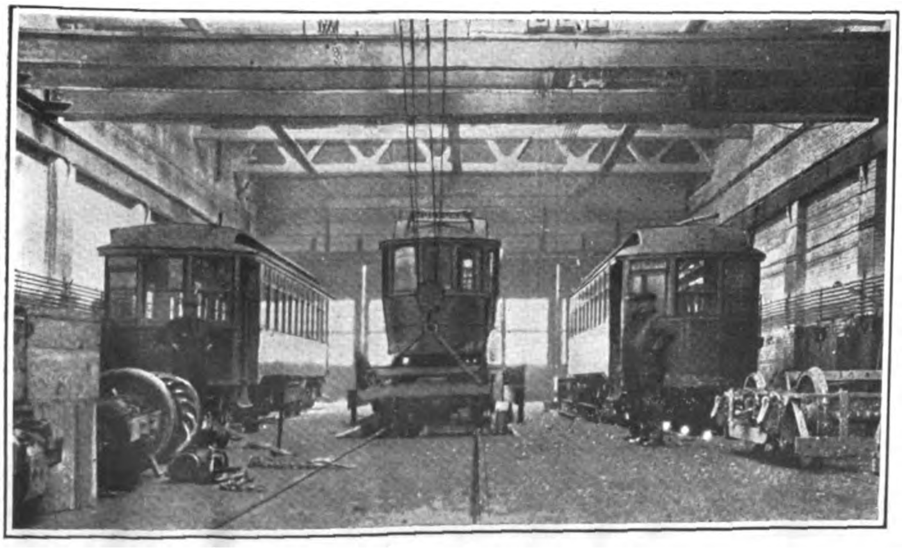
THE Springfield Street Railway has recently undertaken a program of reclaiming its overhead frogs. Investigation showed that these frogs were wearing out in the grooves rather than on the treads. Although the frogs are made of malleable iron, it was decided to try the experiment of building them up by welding. This was done with the ordinary arc-welding machine, after which the frog was ground smooth. A welded overhead frog is shown in the accompanying illustration. The process costs only 75 cents per frog, and experience has shown that a frog reclaimed in this way will wear as long as a new one. This cost figure includes labor and material for the shop work, but not the cost of taking down and replacing the frog on the line, as this would have to be done were a new frog used.



Worn Grooves in This Frog Were Built Up by Welding in Springfield, Mass.

Making Work Easier for the Mechanic

IT IS the theory of the Holyoke Street Railway that better work is done if the job is made as easy as possible for the workman. With this idea in mind, supports have been arranged to raise motors undergoing overhauling so that they can be got at more readily. Wooden horses also are used to raise the trucks to a convenient position. This plan is feasible at Holyoke because the shop is equipped with a 10-ton Niles traveling crane. With this crane it is easy to pick up motors or trucks and place them upon the supports.



All Heavy Equipment Is Handled by a 10-Ton Crane

New Equipment Available

Earth-Boring and Pole-Setting Machine

DUE to the heavy loads which the trolley and transmission lines of electric railways bear, poles must be well set in deep, clean holes. Poles for trolley lines are frequently set at an angle which makes the hole difficult to dig by hand and the pole difficult to set. Also many poles require setting in places where the working space is limited.

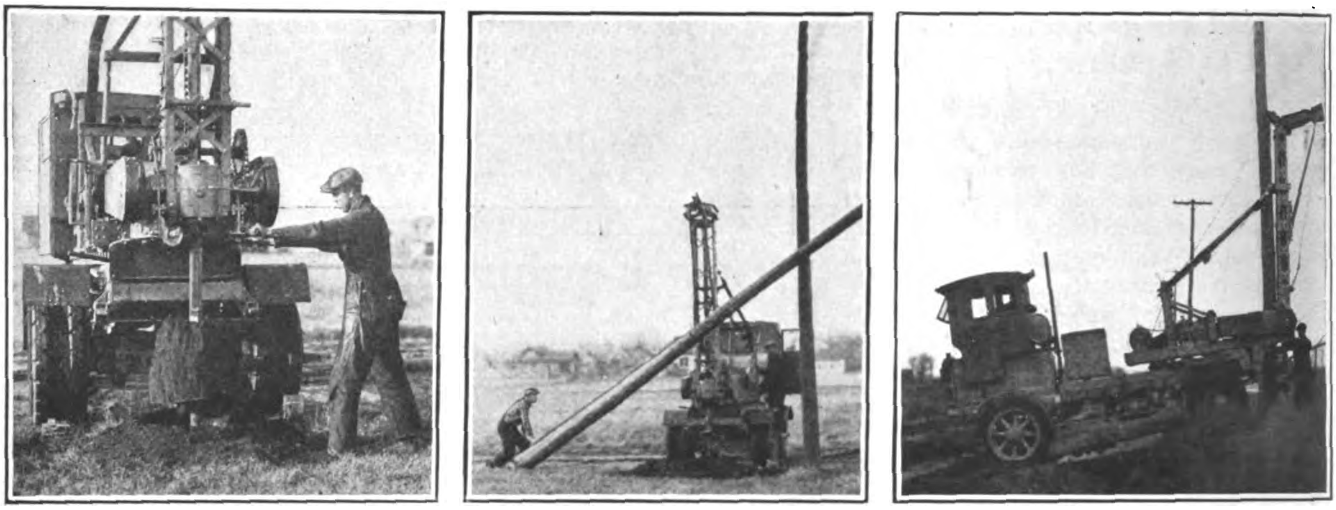
In order to meet these problems, the Four-Wheel Drive Auto Company of Clintonville, Wis., is marketing an earth-boring machine which not only digs the holes but also sets the poles. A special feature of this machine is equal distribution of load and power to the four wheels of the truck. This provides the large amount of traction that is necessary to negotiate bad roads, ditches, grades, etc. The turning radius of the truck is about 25 ft. 3 in., which permits the machine to go into tight places.

This special machine digs holes in any kind of soil except solid rock, raises the pole, drops it into place and then moves to the next location in considerably less time than the hole can be dug by hand. There is also a considerable saving in the number of laborers required, since three men can handle the machine conveniently. Of the three men, one drives the truck and controls the various gear shifts of the machine, one operates the earth-boring machine, and one ground man assists the machine operator.

At the front end, next to the clutch, is a set of gears known as the Debooster gears. Under ordinary operating conditions these gears are not used, the power going direct to the transmission. When the truck is required to operate under subnormal conditions, however, by engaging these gears the entire gear ratio is lowered, giving the truck a low gear ratio of 72.9 to 1. These gears are not used when the earth-boring machine is in operation, as the rotation of the auger would be too slow for satisfactory results. The only place they are used is in moving the truck over bad places.

Back of this gear assembly the transmission is located. This unit is of the sliding jaw clutch type, having gears in mesh at all times. Four sets of gears are provided in the transmission, giving three speeds forward and one reverse to both the truck and the earth-boring machine. When power is applied to the truck the power is transmitted to a sub-transmission by means of a 5-in. silent chain. At this point the power is divided equally between the front and rear axles through the center differential.

In the rear of the transmission is located the power take-off, transmitting the power to the earth-boring machine. Within this power take-off is a double jaw clutch sliding which moves on the square of the transmission shaft. When the power take-off is disengaged or in neutral position, the front end of the jaw clutch is fully engaged with the silent chain upper sprocket, so that when any gear shift is made the transmission main shaft will turn the silent chain, thereby applying the power to front and rear axles. When the earth-boring machine power take-off is en-



At Left, Digging a Hole. Each Load of Dirt Brought Up by the Auger Is Thrown to One Side. In Center, One Man Guides the Pole as It Is Raised. At Right, After the Pole Is Raised It Is Set in Position by the Machine

gaged, the sliding jaw clutch is pushed away from the silent chain sprocket and the other side is engaged to the shaft of the boring machine. The power is therefore transmitted from the square of the transmission shaft through the sliding clutch to the earth-boring machine. The silent chain sprocket remains stationary.

Just back of the tower brace bracket in the rear of the main shaft are two hand levers. One of these levers controls the operation of the winch drum. To engage the winch drum with the main shaft, this lever is pulled out and pushed in until the lever drops in place back of the locking block. The left-hand lever controls the operation of the sluing gear or the turning of the boring machine upon the large bull gear. This hand lever is connected with the main shaft, and the turntable can be swung to the side of the truck.

A ratchet hand lever located opposite the winch drum controls the brake on the winch drum. All levers, including the levers controlling the auger, are located on the right side of the truck within easy reach of the boring machine operator.

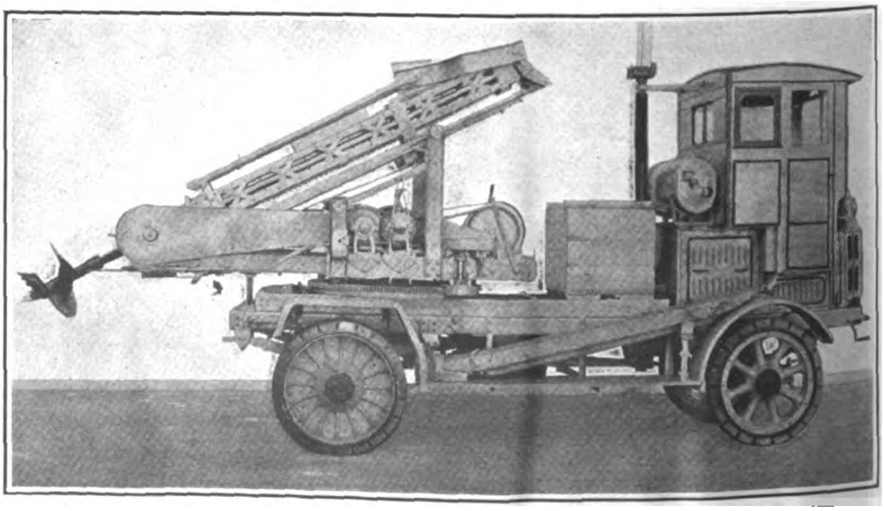
After the truck has been spotted, the emergency brake set and the wheels properly chucked, the power is applied to the earth-boring machine by shifting the central control lever out of neutral and into a position which engages the earth-boring machine power take-off with the transmission.

The signal for first speed is given, the clutch is disengaged and the speed control lever is put in the low-speed position and the clutch pedal is released. This engages the earth-boring machine power take-off with the first speed of the transmission. The engine is then accelerated to the speed called for. The speed of the earth-boring machine is controlled by the acceleration of the engine. By keeping one foot on the accelerator, the driver has full control of the engine at all times.

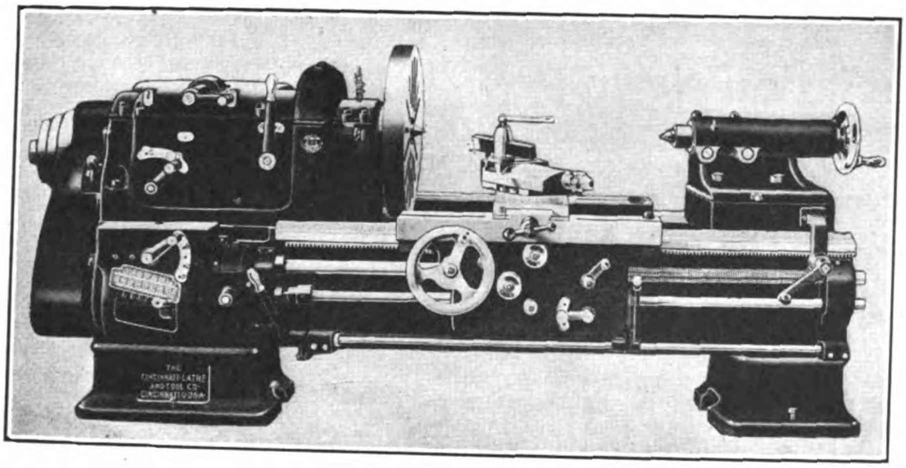
To dig a hole the driver is given the signal for second speed and the auger is raised from the ground by a slight jerk of the auger feed clutch lever, thereby starting the auger spinning. The driver is then given the signal for full acceleration of the engine. The auger is lowered and slowly fed into the ground by gradually lowering it with slight jerks on the feed clutch lever. When the auger is buried into the ground, the drive clutch lever is pushed in and the auger is raised above the ground by pushing the feed clutch lever. The driver is then given the signal for third or high speed with full acceleration of the engine. The dirt which has accumulated on the auger is thus discharged. This operation is continued until the auger shaft has traveled its limit or until the hole has been dug the required depth.

While the operator is digging a hole, the extra man releases the winch drum brake and pulls out the winch cable. The cable is fastened to the pole at as near a balancing point as possible. After the hole has been dug, the chuck blocks are removed from the rear wheels and the truck is driven forward until the winch boom is even with the side of the hole. The height of the boom allows raising of pole clear of the ground, with at least 1 ft. clearance between the boom sheave and the pole.

The pole is then slowly pulled toward the digger and up toward the boom. If there are wires above, the pole must be in a parallel line with the wires. The pole is pulled up slowly, with a man at the butt to guide it through the wires and bring it over the hole. When the bottom of the pole is clear a signal is given to stop, apply the brake, reverse speed and release the brake. Then, with slow acceleration of the engine, the pole is lowered into the hole.



New Earth-Boring and Pole-Setting Machine with Four-Wheel Drive



Single-Pulley, Belt-Drive-Geared Head Lathe

New Geared Head Lathe

A SINGLE-PULLEY, belt-driven lathe with twelve speeds and thirty-two changes of feeds has just been placed on the market by the Cincinnati Lathe & Tool Company, Cincinnati, Ohio. The advantages of the new machine as set forth by the manufacturer are as follows:

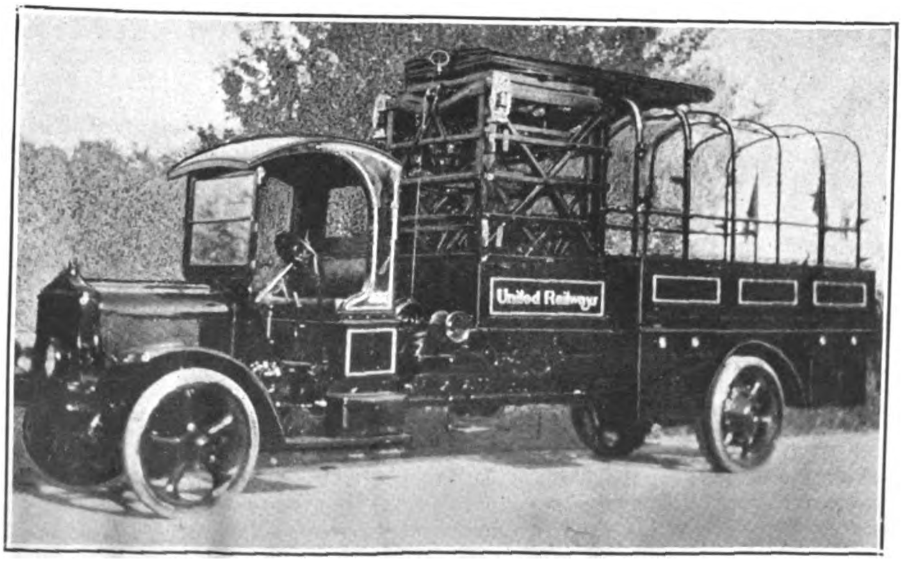
The twelve speeds can be made in an equal number of seconds and with but thirteen gears. Not more than one pair of gears are in mesh for any of the speeds, all of the gearing is contained in one solid housing. The gear velocity is low and as a result the lathe is very quiet running. Shifting levers are located so as to insure ample clearance and make it impossible to cramp or pinch the hand.

The interior of the headstocks can be inspected through an opening in the top of the cover without the necessity of removing the entire cover from the head. The splash system of lubrication in the head sends oil to all the bearings, and an indicator shows the amount of oil in the base of the head. A settling basin and a drain are provided for renewing the oil.

Provision is made for mounting the driving motor, either on the head or underneath the overhang of the head near the floor line. A low mounting of the motor brings the center of the motor near the center of gravitation of the lathe, and thus prevents vibration. Both of the drives are self-contained so that the lathe can be removed without inconvenience. These lathes can be supplied in sizes from 16 in. to 30 in.

New Tower Truck for Baltimore

THE accompanying illustration shows a tower truck which has been furnished recently to the United Railways of Baltimore, Md., by the Hampstead Mill & Body Works, Inc., Hampstead, Md. The body is mounted on a 3½-ton White truck with pole derrick, Trenton tower and winch. The sides are housed at the bottom and are divided into tool boxes of different sizes. Provision is made for carrying long tools by compartments which extend entirely through the truck body. The top has detachable bows with kahki top and curtains.



Tower Truck with New Features

Gun for Spray Painting

A GUN for spray painting that has many new features has been developed by the De Vilbiss Manufacturing Company, Toledo, Ohio. Special attention has been given to simplifying construction and reducing the number of parts and wearing points. The new gun is without yokes, links, pins, or push rods, and has only one pivot bearing. All moving parts are inclosed.

All nozzle parts are self-centering with the fluid tip and air cap positively held concentric. This makes it impossible for the nozzle to get out of alignment when parts are interchanged. The fluid tip is made of nickel alloy steel hardened, heat treated and ground. The body and other parts are made of special high strength, heat-treated aluminum alloy drop forgings. This reduces the weight of the complete unit to 10¼ oz.

New Gun for Spray Painting

A rotary air cap is provided which gives a wide fan spray when placed in a horizontal or vertical position and a round concentrated spray when placed in any intermediate position. The parts which require cleaning are all confined to a quick detachable spray head. This can be taken apart, cleaned and reassembled in less than two minutes. Special attention has been given toward providing accurate balance so that the gun will rest easily in the workman's hand, and the free finger action makes operation easy and non-tiring.

This new gun is designated as type A. Its wide range of work is claimed to result in improved spray painting.

American Association News

Publicity Men Gather at St. Louis

IF THE directors of the state committees on public utility information entertained any doubt as to the American Electric Railway Association being in hearty accord with their efforts and willing to go to any limits to help them, they were removed at the publicity meeting on the day following the midyear gathering in St. Louis.

Directors representing more than twenty states were present. When James P. Barnes, chairman of the committee on co-operation on state and sectional associations, whose chief duty is to see that electric railway executives co-operate with the directors, and W. H. Sawyer, chairman of the committee on publicity, stood up and said that they would go the limit for the directors, they were cheered heartily.

Mr. Barnes explained that it did not seem feasible to send out questionnaires or circular letters to the industry generally, for the reason that such general ammunition seldom brought about good results and also that a very large majority of the executives are co-operating with the state committees. "However, if you have a hard nut to crack, just let me know, and I will get on the job," Mr. Barnes said in closing.

The meeting was attended by about fifty publicity men, all of whom were given an opportunity to talk before the meeting closed. Mr. Sawyer presided.

The outstanding feature of the session was the urging of publicity men to make greater use of the radio. J. C. McQuiston of the Westinghouse Company, who organized the first radio program that company ever had and has been making up programs ever since, said that there was a vast undeveloped field for good publicity material over the radio. The hardest thing in the world, he said, is to get good copy for the program. Mr. Barnes spoke similarly regarding the use of the radio and said that it has been proving very helpful in Kentucky.

B. J. Mullaney of Chicago, who is known as one of the pioneers of the state committee movement, spoke enthusiastically regarding the plan of the association for reaching the individual member. He said he believed that this plan came nearer reaching the grass roots of the situation than that of any of the national utility associations.

Mr. Sawyer and E. F. Wickwire, chairman of the committee on co-operation of manufacturers, called especial attention to current work of the Advertising Section and told how in their opinion the directors could be of service in disseminating advertising material through encouraging electric railway executives to use it.

E. B. Atchley, Northern Ohio Traction & Light Company, made a rousing speech in which he pointed out that many executives were weakening their positions by not doing persistent advertising and publicity work. He said that many executives thought the proper way to do advertising was to begin taking full pages a week or so before they wanted to accomplish something. Failing to obtain the desired results, they blame it on the advertising.

These remarks by Mr. Atchley moved E. E. Soules, Illinois Traction System, to add a few words in a similar vein. He told specifically of one case that he had in mind where an executive who has done no advertising is planning a thirty-day campaign in the hopes of getting a new franchise.

One thing that was especially noticeable was that the directors of public utility information committees voiced their feeling that the railway men were now really appreciating the publicity and advertising end of their business, and were as a whole really doing good work. At previous meetings of this kind the railway man has always been criticised for lack of publicity interest.

Included among those present were State Directors Benjamin E. Ling of Ohio, John C. Mellett of Indiana, George McQuaid of Texas, Horace M. Davis of Nebraska, Joe Carmichael of Iowa, J. B. Sheridan of Missouri, George E. Lewis of Colorado, Earle W. Hodges of Little Rock, Ark., and Samuel T. MacQuarrie of Massachusetts.

Welding Committee's Request Was Approved

E. M. T. RYDER has checked up with President Budd as to the action taken by the executive committee in St. Louis on March 3 on the request of the welding committee for release of the funds originally appropriated for use in building a rotary test machine, to be used in making tests of another nature. There was some difference of opinion as to what action was taken. The JOURNAL printed on page 377 of the March 8 issue the statement that the executive committee did not approve the request of the welding committee. In its original report of the meeting the JOURNAL had recorded the action as approval, but this was changed by one of the officers of the association who understood the action to have been disapproval. This confusion undoubtedly came from the jocular manner in which the motion was finally put. Harry Reid said at the end of the discussion:

"Mr. President, I would like to move that your ideas be embodied in a motion which I would be glad to present."

This came about because two other motions had been made which did not seem to meet the situation, and yet it was evident that the committee desired to carry out the wishes of the president, who had previously said:

"I am perfectly willing that the committee should use the funds that it has for the other purpose, whatever it may want to do with them, but I would like to foreclose any demand for any further money from the association for construction of a machine, if we grant the request that these funds be used as the committee may see fit in its experiments." Later Mr. Budd expressed himself thus:

"I don't seek to minimize the importance of the committee's work, but I will not, as long as I am at the head of the association, acquiesce in the appropriation of any more money for building a machine. . . . I don't believe in an industry such as ours, if you cannot get from actual operating experience in our big companies, under the direction of this committee, sufficient funds to make the demonstrations in practical operation, under practical operating conditions, that you are going to get anywhere by designing a machine to duplicate operating conditions. . . ."

Hearing on Section 15-A

ON MARCH 19 some sixty representatives of interurban railways appeared before the Interstate Commerce Commission in Washington for a hearing to determine whether Section 15-A of the transportation act shall be interpreted to include electric interurban railways. A report of the principal features of the case made by the railway men will be published next week.

News of Other Associations

Illinois Utilities Joint Meeting

THE fourth joint convention of the Illinois Electric Railways Association, the Illinois Gas Association and the Illinois State Electric Association will be held at the Hotel Sherman, Chicago, on March 26 and 27. Joint sessions will be held in the mornings, the meeting on Wednesday being given over to reports of committees and district chairmen, while on Thursday there will be a symposium on "What the National Associations Are Doing" by Alexander Forward, M. H. Aylesworth, Britton I. Budd and A. C. Hall.

At the electric railway session on Wednesday afternoon papers will be presented on "Educating the Public," by Luke Grant; "Education of Employees," by C. B. Goodsell; and a report of the A.E.R.A. committee on co-operation with state and sectional associations by G. W. Welsh.

At the Thursday afternoon session papers will be presented on "Bus Transportation," by Garrett Seeley; "Light-Weight Double-Truck Cars," by H. H. Adams; "Some Problems Involved in the Construction and Maintenance of Electric Railway Tracks," by S. Clay Baker.

At the banquet to be held on Wednesday evening the principal speaker will be Floyd W. Parsons.

New England Club Program

THE twenty-fourth annual meeting and banquet of the New England Street Railway Club will be held at the Copley Plaza Hotel, Boston, on March 27. The annual meeting, with election of officers, will be at 3 o'clock. There will be a reception at 6 o'clock, followed by the dinner. The Hon. Robert M. Washburn will be toastmaster, and the speakers will be United States Senator George H. Moses of New Hampshire, Gov. Channing H. Cox of Massachusetts, Mayor James M. Curley of Boston and the Rev. William Porter Niles.

The News of the Industry

Bus Talk in Cleveland

Two Sets of Interests Active—Cleveland Railway States Its Attitude—Hearing Set for April 10

Bus interests are threatening the Cleveland Railway with competition. A company, known as the Cleveland People's Motor Bus Corporation, has already requested the Ohio Public Utilities Commission to grant it a certificate of convenience and necessity for the operation of 175 double-deck buses paralleling fourteen of the main routes of the railway.

This company says it desires to operate its buses on a six to eight-minute headway between 6 a.m. and midnight, and that it will provide seats for each passenger, charging a 10-cent fare. It also insists that it will not really be in competition with the railway, but will give a parlor car service, something between that supplied by the taxicab and the street car. Most of its business, so the representatives of the company say, will come from people who now drive their own cars to business. A hearing on this company's application will take place on April 10 before the State Public Utilities Commission at Columbus.

Representatives of another company, backed by interests controlling the Red Top Taxicab Company, say they are prepared to provide bus service in Cleveland, if the Cleveland Railway is not disposed to give this sort of service.

Under the Tayler service-at-cost franchise in Cleveland, the railway and the car riders are partners. Because of this fact, the City Council takes the position that if there is any bus service in Cleveland the Cleveland Railway should give it. John J. Stanley, president of the Cleveland Railway, says his company is willing to operate buses providing Cleveland people desire this service and the City Council authorizes the company to give it.

At a hearing before the committees of the Council on public utilities and street railway Mr. Stanley asked the representatives of the Cleveland People's Motor Bus Company whether they would be willing to accept a bus franchise containing terms similar to the Tayler franchise, which limits the return to stockholders to 6 per cent a year. The representatives of the Motor Bus Company present said they were unable to answer this question in the absence of financial backers, and the hearing was adjourned for a fortnight.

Members of City Council and others versed in the law are of the opinion that the State Public Utilities Commission has no jurisdiction over Cleveland streets and cannot allow any bus company to operate in Cleveland without a franchise from the Cleveland City Council, because Cleveland is a charter city functioning under the home rule provision in the state constitution. If this view is upheld by the State Public Utilities Commission on April 10, or by the courts, as appears likely, it is believed that if buses are operated in Cleveland, they will be controlled and operated under the direction of the Cleveland Railway.

Nine-Cent Fare in Cincinnati

Fares in Cincinnati will be increased from 8½ to 9 cents beginning April 1. The Cincinnati Traction Company has posted notices in its cars that such increase will be put into effect under the terms of the service-at-cost franchise ordinance. W. Jerome Kuertz, Director of Street Railways, recently called attention to the fact that there was a large deficit for the current quarter in the company's receipts and that the city franchise tax would not be earned in full during the quarter. Under the ordinance the fare is to be raised ½ cent at the beginning of the next quarter when such conditions exist.

The increase of ½ cent in the rate of fare will affect only about 65 per cent of the riders, as 35 per cent now pay the 9-cent cash fare. Under the new rate no tickets will be sold at 8½ cents. Every one will pay 9 cents a ride, whether he tenders cash or buys tickets.

It will be necessary for the city and the street railway to agree upon a modified franchise and for the stockholders of the traction company and the street railway to approve the terms of the agreement between them before the new financial arrangements intended to be carried out by the Cincinnati Street Railway and the Cincinnati Traction Company can be put into force. This will take several weeks' time at the very least. For this reason the corporate changes could not be carried out in time to stay the fare advance.

Commission Against Five-Cent Fare for Trenton

The State Board of Public Utility Commissioners has informed Mayor Frederick W. Donnelly of Trenton, N. J., that the present 8-cent fare of the Trenton & Mercer County Traction Corporation is not excessive. The board disagrees with the Mayor in his stand that a 5-cent fare should be fixed. In reply to the suggestion of the Mayor that a lower fare would probably result in an increase in the number of car riders, the commissioners state that an attempt to force a reduction in rate without evidence of an excessive return should not be made unless it appeared clear at the present time that the company could bring about such reduction without creating a deficit which later might have to be made up by a higher fare.

Franchise in Columbus

Twenty-five-Year Grant for Ohio City Now Up for Discussion by City and Railway

Surrender of the perpetual franchises of the Columbus Railway, Power & Light Company, Columbus, Ohio, at the expiration of a ten-year period, immediate extension of two lines in the city and a yearly extension of 1 mile during a ten-year period, are the principal features of a proposed franchise ordinance introduced at the meeting of the City Council on March 17. A round table discussion between members of the City Council and officials of the company was set for March 21.

The franchise as proposed would be effective for a period of twenty-five years. It provides also that the company shall spend $200,000 this year for new equipment and that there shall be no change in the present fare, namely, 6 cents cash, or five tickets for 25 cents and free transfers.

The perpetual franchise clause says:

> The rights, privileges and grants herein made are so made with the express understanding and on the condition that the acceptance hereof by the Columbus Railway, Power & Light Company shall operate as a surrender by said company, its successors and assigns, of all claims or rights to any and all perpetual franchises in any street or streets in the City of Columbus, all such claims to terminate with the expiration of the franchise herein granted.

As to railway extensions, it is provided "that either the city or the company may propose extensions, and Council at its discretion may require reasonable extensions operated by the company under safeguards considered reasonable to the company and the city."

The immediate extension of two car lines, as provided in the franchise, does not apply to this 10-mile provision. One of the car lines, the Summit Street, will be extended 1 mile within the next six months, while the Mound Street line will go to the city corporation line. Provision is made that Indianola Avenue, on which the former line is to run, shall be widened to 50 ft. or more from curb to curb within six months.

In addition to these extensions it is also proposed that the company shall change the narrow gage tracks of part of the North High Street line to the corporation line to permit other cars to operate over the tracks. This improvement is to be made one year after the passage by the City Council of an ordinance directing it, the proposed franchise holds.

Arrangements have been made, if the franchise is adopted, whereby railway service to Clintonville, a suburb, will be extended for the distance of 1 mile. This, together with the West Broad Street extension, will make 2 miles of additional line available immediately, provided Council takes early action on the measure.

Monorail Plan Rejected at Detroit

The Detroit Rapid Transit Commission has had under consideration the petition of the Michigan Elevated Railway relative to considering that company's equipment in connection with rapid transit for the city and reported that it does not feel warranted in considering for Detroit any type of transportation not fully developed and proven in operation. The observations of the commission as set forth by Sidney D. Waldon, chairman, include the statement that in considering the question of rapid transit for Detroit the commission has dealt with the subject from the viewpoint of the requirements of the city in 1950, with a probable population of 2,500,000, as well as with the needs of the present city with its present population. The capacity for mass transportation, practicability of operation, economy of construction and general desirability have been the governing considerations of the commission's study.

The commission arrived at this conclusion after a careful study of all types of elevated railways in operation here and in Europe. Among those types the monorail lines, existing and proposed, were included. There are two monorail lines in operation—one in Ireland, of a type where the weight for the car and passengers is balanced on either side of the rail, the car just clearing the ground, and one in Germany, connecting the industrial towns of Barmen and Elberfeld, of the free suspended type, the structure carrying the car being at a height sufficiently above the ground to clear the traffic. This system has been in operation since 1901 and repeated attempts have been made to secure its adoption in Berlin without success.

It is cited that there are no monorailways in operation in the United States.

The commission has made surface rapid transit the keynote of its plan. By so doing, it will effect a saving of millions of dollars in future construction and at the same time offer a means of handling and controlling the motor traffic expansion of the future at a reasonable cost, it is believed by the commission. It considers this feature too valuable in the interest of the community to justify abandoning it for any other type or for an undemonstrated possibility.

Both Trolley and Bus Needed in Newark

Rapid, safe, sanitary and comfortable mass transportation in the morning and the evening rush hours is necessary in Newark. In order to meet that need the city requires the full resources of both the trolley and the bus. These are among the main findings contained in the report just presented by a committee of the local Chamber of Commerce appointed to inquire into the matter.

The committee holds that the elimination of the independent bus owner from the transportation field is neither necessary nor expedient. The independent operator, according to the committee, has a distinct field, not only to fill certain present demands but also to develop new routes and territory.

The conclusion of the committee is that co-ordinated service should be committed to the Public Service Railway, but that co-ordinated service applies only to those routes on which the bus and the trolley are in competition. The committee says that "healthy competition along salutary lines should be fostered and encouraged." The committee expresses the belief that the adoption of the principles which it lays down will mean to Newark and its sister communities "a 5-cent fare, no monopoly and growing transportation as Newark grows."

Extension of Franchise Sought in Springfield, Ill.

A new franchise for the Springfield Consolidated Railway, Springfield, Ill., is up for consideration. Proposals and counter-proposals have been made. The present franchise does not expire for four years but the company had given notice to the city through A. D. Mackie, general manager, that it would be unable to go ahead with its share of the public improvement program unless the franchise was lengthened. The company is paying for its share of the improvements which run into thousands of dollars by the sale of bonds. Under the present franchise, soon to expire, the company has found it difficult to carry out necessary financing to the best advantage.

In its appeal the company requested that the sections of the old ordinance providing that the company pave between its tracks and that the company pay a franchise tax to the city, be done away with. These requests were supported by the contention that these costs, which run into high figures, are in the last analysis met by the passenger and not by the company.

A number of sections of the company's proposal refer to buses as well as street cars, and the ordinance provides that a blanket franchise shall be voted to the company covering all the streets within the present limits of the city of Springfield, or within the boundary lines as they may be extended from time to time during the twenty years, subject to the selection of specific streets from time to time by the Council and the company.

The counter-proposal of the city was drawn by City Attorney Sampson. It denies the plea of the company that the paying charges section be discarded and drops the special tax only in part.

Among the provisions of the ordinance suggested in behalf of the city are:

1. That the company shall pay for all paving between its tracks.
2. That the company shall pay a 4 per cent tax on its gross earnings for ten years and a 2 per cent tax for the next ten years. In the old ordinance under which the company is now operating it paid 2 per cent for ten years and 4 for the next ten.
3. That buses be used on certain streets to give additional service to thickly populated sections of the city.
4. That the city reserve to itself the right to purchase the street railway at any time during the life of the franchise at a price to be determined upon by arbitration.

Board Backs Mayor's Anti-jitney Ruling

A definite stand to support Mayor Edwin F. Leonard of Springfield, Mass., in his decision to rule independently operated buses from the streets of the city after May 1 was taken by the transportation board March 18 following a hearing before which a committee of the Springfield Bus Owners' Association appeared.

The decision was made on the ground that the street railway is a necessity and that it is unfair to allow any independent transportation group to take away any of the patronage from an essential service.

Richard J. Talbot, counsel for the Bus Owners' Association, was told by Alderman John D. Stuart, chairman of the transportation board, that if the bus owners secured signatures of half the voters in the city giving it as their opinion that the buses should be retained, the board will again consider the matter of continuing their licenses. Mr. Talbot says that an effort will be made to comply with that condition.

Upholds Fight Against Unionizing Pacific Electric Employees

The United States Supreme Court at Washington, D. C., in a decision on March 3 upheld the fight against unionizing the Pacific Electric Railway, Los Angeles, Cal. This ruling puts a final and permanent quietus on the efforts of professional organizers to unionize the employees of this system. M. E. Montgomery and J. A. Farquharson of the Brotherhood of Locomotive Engineers and Brotherhood of Railway Trainmen had petitioned for a writ of review to reconsider the decision of the Circuit Court of Appeals, rendered in Los Angeles on Nov. 13 last. That decision was referred to in the ELECTRIC RAILWAY JOURNAL, issue of Dec. 1, 1923. This final decision enjoins the two brotherhoods and their officers and agents and all others acting with them from making any attempt to cause the Pacific Electric employees to join such brotherhoods and through them deal with the Pacific Electric Railway.

The numerous court actions grew out of the strike of Pacific Electric trainmen in 1918. At that time the company obtained a temporary injunction restraining the brotherhoods in their efforts to unionize the company's employees. This injunction was granted the United States District Court of Los Angeles. The next day the strike collapsed.

The brotherhoods later appealed to the United States District Court of Appeal at San Francisco and this court sustained the order of the lower court granting the temporary injunction. The case then came up for trial on the issues involved before United States Judge Radkin, who was sitting as a visiting judge in the Los Angeles Federal court in the early part of 1923. The case being decided in favor of the Pacific Electric Railway, the brotherhoods appealed to the District Court of Appeal, which sustained the lower court a second time. The brotherhoods then appealed to the United States Supreme Court for a writ of review.

Franchise Agreement in Birmingham

At a conference between the City Commissioners of Birmingham, Ala., and the receivers of the Birmingham Railway, Light & Power Company, held on March 15, the receivers agreed to pay the city the sum of $35,000 for a thirty-year franchise over 140 blocks of city streets scattered over the city. Thy represent about 10 per cent of the trackage. The remaining 90 per cent was originally granted in perpetuity. In discussing the franchises City Commissioner Harrison indicated that with these franchises for short stretches of track expiring in periods of from four to six years it was in the interest of the city to accept any reasonable offer, particularly as the question was tied in with the lifting of the receivership and the franchises for the short stretches had no inherent value except in so far as they were joined with the perpetual grant so as to facilitate the operation of the system as a unit.

Seattle Employees Gain Support of Committee in Income Fight

In their fight against paying the federal income tax, the Seattle Municipal Railway employees have won the support of the city utilities committee of the City Council of Seattle, Wash. The committee recommended that the corporation counsel be asked to contest the ruling, which, in effect, declares that the railway workers are not exempt from the income tax, as are other city employees. The theory of the ruling is that the railway is not a branch of the city government, but a business venture of the city. A federal court injunction may be procured against the tax collector.

Traffic Experiments in Milwaukee

A co-ordinated effort is being made to solve the traffic problem in the downtown section of the city complicated by the addition of the city buses of the Milwaukee Electric Railway & Light Company to the present traffic. The safety commission with the co-operation and permission of the railway has proposed that two experiments be made to fix the best practice. One plan of the bus zoning experiment, to be given a two weeks' trial, will involve the marking off of spaces in each block of Grand Avenue sidewalks in the rear of the street car safety zones where the buses may drive up and stop flush with the walk and load and unload passengers. No other vehicles will be allowed to occupy these zones which will act as platforms. The other plan which will also be given a two weeks' trial will be to have the buses stop on the car tracks loading and unloading passengers from the same safety zones that cars now use.

Air Pressure Tank Order Expected in Indiana

An order is in preparation requiring interurban and street railways in Indiana to show on each car the date of safety inspection of air pressure tanks on cars and otherwise providing greater protection for passengers from possible explosions of such tanks, due to overpressure. The order will be promulgated by the Public Service Commission. It is understood that the commission will require that the tanks be equipped with safety "blow-offs" and be reguarly inspected. On March 4 the commission held a conference with representatives of railways looking toward such regulation. A committee was formed consisting of G. R. Green, master mechanic of the Chicago, South Bend & Northern Indiana Traction Company, and others. This body has drafted recommendations for the order. David E. Matthews, chief of the inspection division of the commission, is preparing the recommendations, together with suggestions of the division for presentation to the commission, which then will issue an order.

Bill Assessing Property for "L" Removal Signed

The two Burchill bills authorizing New York City to remove the elevated structure on Sixth Avenue were signed on March 18 by Governor Smith. Under the new law the railroad will be compensated by the city for the destruction of its property. An additional assessment against the property to be benefited by the improvement will be made by the city.

One of the bills provides for the removal of the spur from Fifty-third to Fifty-ninth Street and the other for the removal of the rest of the Sixth Avenue elevated line from Fifty-third Street to the Battery, and the construction of a subway to replace it, including, of course, the necessary connection with existing and projected subway lines.

Julius Miller, president of the Borough of Manhattan, who sponsored the removal, has announced that he will submit to the Board of Estimate plans for the demolition of the spur. No opposition is expected, as the members of the board are understood to be united on the desirability of its removal.

Bus Operation in Port Jervis Ready When Authorized

Plans for bus operation in connection with the railway lines of the Port Jervis Traction Company, Port Jervis, N. Y., were outlined at a hearing on the application of the Port Jervis Transit Company, Inc., subsidiary of the railway, for such operation before the Public Service Commission, March 17.

The company wants a permit to run two twenty-one-passenger Locomobile "Road King" buses on a one-hour headway over certain streets of Port Jervis. The desired route runs practically north and south through the city. The railway lines run approximately east and west. Transfer from bus to trolley and vice versa will be free. The fare will be 5 cents for each of two zones. A 10-cent through fare will be charged with ten tickets for 75 cents. The buses will serve a district heretofore without public transportation facilities. No action has as yet been taken by the commission.

Extensive Traffic Survey Planned for Los Angeles

Following appeals from the Los Angeles Traffic Commission to take early action in the matter of definite relief to traffic congestion in the downtown district of the city, the City Council proposes to approve an appropriation of $40,000 to carry out an extensive transportation survey of Los Angeles. The survey is to be conducted under the supervision of F. A. Lorentz, chief engineer of the Board of Public Utilities, and it is planned to engage Major R. F. Kelker of Chicago to direct the survey. It was urged that the appropriation be raised to $100,000, with the request that Los Angeles County contribute half of this amount, as the survey to accomplish the desired results must extend out into the county highways.

With the rapid automotive growth it is considered necessary that a comprehensive subway system be planned and constructed and street cars be removed from the street surface.

It is contended by the City Council that a bond issue of $125,000,000 would be required to finance the subway system, but the bonding capacity of the city, it is stated, will not allow such bond issue to be voted by the people. On the other hand, it has been suggested that private capital be induced to construct a rapid transit system.

The Pacific Electric Lines took the first step to relieve traffic congestion in Los Angeles when on Feb. 21, 1924, preliminary work was undertaken on its Hollywood-Glendale subway.

Bus Suggested for Shore Service

Philander Betts, chief inspector of the Board of Public Utility Commissioners of New Jersey, recently appear before the Chambers of Commerce of Cape May and Atlantic City and submitted a report on the electric railway situation on the shore in which he urged bus service on the shore road between Absecon and Pleasantville and the elimination of one-man cars on the suburban line. He urged the Atlantic City & Suburban Company to abandon duplicate service across the meadows and submit a report to the commission by April 1. The expert for the railway also advocated the elimination of the combination baggage and passenger cars now in use on the Atlantic City & Shore Fast Line.

Neutral Arbitrator Selected

Lewis C. Parker of Westfield, Mass., has been selected as neutral arbitrator in the dispute between the Worcester Consolidated and Springfield Street Railway Companies and the carmen's union. The carmen are asking for an eight-hour day, a six-day week and an increase in pay of about 20 cents an hour; also a reduction in the maximum spread for combination runs from fourteen to eleven hours. The company offers to continue the present maximum wage of 58 cents, but wants to eliminate certain bonuses, or if the bonuses be not eliminated, to decrease the hourly wage by 5 cents. Bentley W. Warren represents the companies and James H. Vahey the carmen in the proceedings.

Higher Fare Increases Revenue by $40,000

Increase to an 8-cent fare with tickets selling at four for 30 cents brought in approximately $40,000 added revenue for the Community Traction Company, Toledo, Ohio, during February, according to the report of Commissioner W. E. Cann to the board of control at the monthly meeting.

Passenger traffic was scarcely affected at all by the fare increase. The average daily business was 182,092 revenue passengers in February, as compared with 178,574 in January and 182,305 a year ago. This was 8.67 passengers per car-mile, which is the highest since last March. Total revenue passengers numbered 5,280,660 for the month. As a result of operations there was added to the stabilizing fund in February $18,322, as compared with $2,757 for the same month last year. A credit of $15,000 for extraordinary maintenance was made in addition to the $40,000 usual allowance. Gross revenue amounted to $364,719, as compared with $312,946 last year. Operating expense of $179,000 represents an increase of 2.067 cents per car-mile, which is due almost entirely to the higher wage scale now in effect. Ratio of operating expense to gross income is 69.551 per cent. Operation of the bus feeder lines showed a loss of $860.65 for the month.

One Bid on Bus Lines.—Only one bid has been received by the City Commission of Astoria, Ore., on bus lines to supplant the Pacific Power & Light Company's system, which is to suspend operations. It was submitted by S. W. Lovell, Astoria, and W. E. Young, Portland, under the name of the Astoria Transit Company. The bidder asks for a twenty-year franchise, agrees to give a fifteen-minute service with not less than six Mack buses, charge a fare not to exceed 10 cents and pay 2 per cent of the gross receipts to the city. The bid is being examined by the city manager and attorney.

Appears to Contest Lower Fare.—William H. Maltbie, representing the United Railways & Electric Company, Baltimore, recently appeared before the Senate committee on corporations at Annapolis in opposition to the passage of a bill offered in the Maryland General Assembly to force the company to reduce fares in Baltimore from 7 to 5 cents. Interesting data were contained in a chart submitted to the committee by Mr. Maltbie showing how the 7-cent fare is expended.

Bus Service in Summer Months.—The Hartford & Springfield Street Railway has projected a limousine bus service between Springfield, Mass., and Hartford, Conn., in the summer months, in addition to the service now being maintained, which includes buses from Springfield to Windsor Locks and electric cars for the rest of the route. It is proposed to fix the fare for the round trip at $1.25. Occasional excursions from Hartford to more distant points, to include Greenfield and Brattleboro, are contemplated.

Bulletin Tells Everything.—The Pittsburgh Railways, Pittsburgh, Pa., has issued a time-table guide and general information bulletin for its patrons. The booklet contains a description of the various points of interest in the city and the routes to arrive at such places, a little account on parking regulations, something about what happens to your fare after you give it to the company and some things the company is actually doing to improve service. A map is included showing the territory served by the Pittsburgh Railways.

Electrification Planned.—The Reading Company (Philadelphia & Reading Railway) Philadelphia, Pa., has announced intentions of electrifying its line between St. Clair and Frackville, Pa., at an estimated cost of $1,500,000. Preliminary plans and surveys are now under way for this improvement, which will include automatic substations, line equipment, etc.

Wants to Discontinue Transfer Use.—The Puget Sound International Railway & Power Company, Everett, Wash., has asked permission from the State Department of Public Works to discontinue the issuance of transfers on its bus system, which superseded the company's railway system in Everett. The company has asked permission to try for ninety days, beginning April 1, operating without transfers, alleging that the present fare of 5 cents will no longer permit issuing transfers.

Two Arbiters Named.—Representative Peter F. Tague of Massachusetts has been named to represent the union trainmen of the Capital Traction Company, Washington, D. C., on the arbitration board to determine whether wages of motormen, conductors and shopmen should be increased at this time. The Capital Traction Company announced that its arbitrator will be Stanton C. Peelle, member of a law firm. These two men will select a third arbitrator to represent the public.

New Buses in Hartford.—The Connecticut Company has purchased two new buses to put in operation on the Maple Avenue route, Hartford. The new buses will seat twenty-nine people. Buses at present in use on Maple Avenue will be transfered to the High Street line.

Fares Lowered.—Reduced fares for school children between the ages of five and twelve went into effect on the cars of the Olean, Bradford and Salamanca Railway, in Salamanca, N. Y., on March 8. Tickets are now sold in sets of five for 25 cents, and these tickets are good in the city limits of Olean, Bradford and Salamanca, but not on interurban cars.

Franchises Advertised.—D. P. Abercrombie, receiver for the Connecticut Valley Street Railway properties, has advertised franchises, tracks and all buildings and equipment to be sold at private sale, and invites offers up to March 28. The sales are to be subject to approval by the Massachusetts Supreme Court.

Winter Hard on Railways.—The United Electric Railways, Providence, R. I., has estimated that the recent record March gale will cost between $20,000 and $30,000. Transportation is now entirely restored within the city limits and outside the limits. The Union Street Railway, New Bedford, Mass., has just recovered from the effect of a severe blizzard which crippled the interurban line to Fall River. Nearly one-quarter of the company's Much of the company's overhead work was blown down.

Trolley Likely to Go.—The Hornell Traction Company, Hornell, N. Y., has decided not to keep the line in operation more than two months longer. In the meantime, a plan is to be submitted to the stockholders to sell the equipment and put in operation a fleet of buses under a franchise from the city.

Railway Complains of Bus.—In letters signed by Col. Albert T. Perkins, manager for Receiver Rolla Wells of the United Railways, St. Louis, Mo., addressed to the St. Louis Board of Public Service protest is raised against the operations of the People's Motorbus Company in that city. The railway complains that the operation of buses on Lindell Boulevard interferes with cars and other traffic and that the buses are a menace to life and property, particularly east of Twelfth Boulevard, the congested section of the city.

Franchise Deal Confirmed.—The private bills committee of the Legislature on March 13 confirmed an agreement between Ottawa city and the Ottawa Electric Railway, Ottawa, Ont., renewing the franchise of the company for thirty years with a 5-cent fare for that time. There is a provision that at the end of each five years the city may take over the railway at its arbitrated value. One point debated was whether the railway should be exempt from taxation for school purposes. The bill, however, carried without amendment.

Radio Talks Reprinted.—The radio talks on "The Boston Elevated—As You Should Understand It" by Edward Dana, general manager of the property, have been reproduced in pamphlet form. This nineteen-page pamphlet is illustrated. Portions of Mr. Dana's talks were published in the ELECTRIC RAILWAY JOURNAL, issue of Jan. 12, 1924.

Upholds One-Man Car.—The use of one-man cars effecting lower operating costs in the Commonwealth has been commended by the commissioners in the annual report of the Massachusetts Department of Public Utilities. The statement is made that the use of these cars has been the deciding factor in enabling the companies to render service that otherwise could not have been furnished at all and to render more frequent service where the service formerly given was infrequent and inadequate.

Same Insignia on Buses.—The buses of the Los Angeles Railway will hereafter be inscribed with "Los Angeles Railway" spelled out in full length along the sides. They were formerly monogrammed "L. A. Ry. Co." It was decided that since the buses were a part of the railway they should be marked exactly like the street cars.

Financial and Corporate

Youngstown Lost $198,678 in 1923

Gross Revenue Rises 14.5 per Cent, but Mileage Increases 18.8 per Cent—Deficit Reaches $1,039,794

The 1923 report of the Youngstown Municipal Railway, issued through Harry Engle, Street Railway Commissioner, indicates that the deficit in the fare stabilizing fund has increased to $1,039,794.

FINANCIAL AND SERVICE STATEMENT OF THE YOUNGSTOWN MUNICIPAL RAILWAY

GROSS EARNINGS

1919	$1,418,217
1920	1,907,252
1921	1,463,352
1922	1,491,095
1923	1,707,530

CAR-MILES OF SERVICE

Year	Trolleys	Bus	Total
1919	3,358,834	......	3,358,834
1920	3,459,510	......	3,459,510
1921	3,579,532	......	3,579,532
1922	4,010,067	112,901	4,122,968
1923	3,979,806	919,557	4,899,364

PASSENGERS CARRIED

1919	24,500,000
1920	28,493,713
1921	21,703,998
1922	26,337,168
1923	28,807,622

CAPITAL VALUE

Jan. 16, 1919	$3,900,000
Dec. 31, 1919	4,384,484
Dec. 31, 1920	4,384,603
Dec. 31, 1921	4,406,071
Dec. 31, 1922	4,510,994
Dec. 31, 1923	4,640,298

DAMAGES

1919	$79,359
1920	162,658
1921	142,169
1922	154,942
1923	135,440

TAXES

1919	$86,477 32	paid in 1920
1920	93,588 03	paid in 1921
1921	83,897 23	paid in 1922
1922	96,710 46	paid in 1923
1923	97,735 30	paid in 1924

STABILIZING FUND DEFICIT

Jan. 15, 1919, cash in bank	$100,000
Dec. 31, 1919, cash in bank	20,946
Dec. 31, 1920, deficit	19,837
Dec. 31, 1921, deficit	524,140
Dec. 31, 1922, deficit	841,115
Dec. 31, 1923, deficit	1,039,794

LOSSES IN OPERATION

1919	$76,153
1920	40,684
1921	504,304
1922	316,974
1923	198,679
Total	$1,139,794

RECAPITULATION FOR YEAR

Gross revenue from all sources		$1,707,542
Operation	$1,144,858	
Maintenance	359,478	1,504,336
Revenue before taxes		203,205
Taxes		97,735
Revenue before payment of rent		105,470
Rent		304,149
Deficit after payment of rent		198,678

Gross increased from $1,491,095 to $1,707,530, or 14.5 per cent, but mileage increased from 4,122,968 to 4,899,364 vehicle-miles, or 18.8 per cent. Almost all of this increase was in bus-miles. The actual increase in motor-bus miles was 808,656, but the total increase (776,396 vehicle-miles) was somewhat less owing to the replacement of two car routes by bus routes.

The first buses were installed on Dec. 1, 1922, on two new routes. On March 18, 1923, the Indianola and South bus lines were added to cover more ground than the replaced Woodland and Williamson car routes. Later in the year more bus routes were added, making a total of seven. At present, the commissioner has ten new buses for installation as soon as the jitneys are finally ejected.

If allowance is made for the increase in vehicle-miles the earnings per mile in 1922 were on the order of 36 cents, whereas in 1923 the average was only 34.8 cents, against a cost of service of 39.1 cents.

During all of 1922 and up to April 1, 1923, inclusive, the fare was 9 cents cash, 8⅓ cents tickets, 1 cent transfer and $1.25 weekly pass. At the suggestion of Commissioner Engle the company installed a schedule of 7 cents cash, 6⅔ cents tickets and 1 cent transfer on April 2, 1923. Revenues decreased and after ten weeks the company went to a scale of 8 cents cash, 7 1/7 cents ticket and 1 cent transfer. This produced some improvement, but still left the revenue per vehicle-mile below the figure of 1922.

The figures for the past five years as presented in the report to City Council are contained in the accompanying table.

$2,436,238 Net Income for Atlanta Company

No separate statement of earnings of the railway department is contained in the report of the Georgia Railway & Power Company, Atlanta, for 1923. Operating revenue of the entire system was $16,006,928 in 1923, compared with $14,449,497 in 1922. The net income for 1923 before depreciation and dividends was $2,436,238, compared with $1,917,043 for 1922. On Dec. 31, 1923, the total mileage of street railway tracks (on a single-track basis) owned, or leased and controlled and operated by the company, exclusive of the street railway mileage in Gainesville, was 244 miles. During the year 1923 the company placed an order for twenty city type electric railway double-end prepayment passenger cars, with seating capacity of forty-eight passengers each, at an aggregate cost of $274,637. As of the date of the report, twelve of these cars had been delivered and it was expected that the other eight will probably be delivered within the next few weeks.

During 1923 the company transported on its city and suburban system 95,357,117 passengers as against 92,172,664 passengers in 1922. In addition, it transported 634,014 passengers on the Stone Mountain line in 1923 as compared to 557,274 in 1922. The Atlanta Northern Railway, which is the interurban line between Atlanta and Marietta, transported 1,218,697 passengers in 1923 as compared to 1,131,278 passengers in 1922.

$2,131,164 Net at Milwaukee

Operating revenues of the railway department of the Milwaukee Electric Railway & Light Company for the year ended Dec. 31, 1923, amounted to $10,559,581, an increase of 8.61 per cent over 1922. The percentages of operating revenues of the various utilities appropriated for maintenance and depreciation of physical property were:

	Per Cent
Railway	22.30
Electric light and power	12.75
Heating	16.64

Net income available for the payment of dividends was $2,131,164. Capital expenditures during the year amounted to $5,844,745, as follows:

Railway utility	$1,699,442
Electric power and heating utility	2,982,190
Common and miscellaneous	1,163,112

During the year $243,854 worth of property was withdrawn from service.

The company has successfully continued to obtain a good share of its capital requirements from the sale of preferred stock to investors in the communities in which the company operates. It now has approximately 10,000 preferred shareholders.

INCOME ACCOUNT OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY FOR THE YEAR 1923

Operating revenues		$22,206,800
Operating expenses:		
Ordinary operating expenses	$14,534,908	
Depreciation (reserve credit)	1,521,338	
Taxes	1,567,091	
Total operating expenses		17,623,337
Net operating revenues		$4,583,463
Non-operating revenues		274,141
Gross income		$4,857,604
Interest charges:		
Interest on funded and unfunded debt	$2,299,183	
Interest on depreciation reserve balances	383,932	
Interest on other reserve balances	43,325	
Total interest charges		2,726,440
Net income		$2,131,164

The directors authorized the sale of $1,000,000 of 6½ per cent ten-year gold notes, Series D, dated Aug. 1, 1923, maturing on Aug. 1, 1933. The notes are being sold through the securities department of the company for cash at par. Up to Dec. 31, 1923, a total par amount of $122,500 had been issued and sold.

The revenue passengers carried increased from 144,238,122 in 1922 to 153,626,868 in 1923. The company very frankly says that a good share of this increase is due to the company's foresight in establishing up-to-date bus service.

STATISTICAL DATA OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY

	1923	1922
Miles of track owned	413.14	409.66
Miles of track leased	1.56	1.56
Miles of track operated	388.99	385.94
Revenue passengers carried	153,626,868	144,238,122
Transfer passengers carried	54,238,201	54,198,925
Per cent transfer to revenue passengers	35.31	37.58
Receipts per revenue passenger	$0.0664	$0.0652
Number of passenger cars owned	850	850
Number of passenger motor buses owned	93	76

New Jersey Railway Will Benefit by Refinancing

Thomas N. McCarter, president of the Public Service Corporation of New Jersey, in referring to the plan for refinancing which was mentioned briefly in ELECTRIC RAILWAY JOURNAL for March 13, says that with the adoption of the plan the holders of the securities of the underlying companies will clearly benefit to a very marked degree since the development and upbuilding of their properties will thus be assured.

With respect to the Public Service Railway he says the position of that company and the holders of its securities will be greatly strengthened because the corporation itself, as the owner of all the capital stock of the railway, will be placed in a position, as the result of the adoption of the plan, to finance the railway's capital requirements until such time as the credit of the railway will enable that company to stand upon its own feet in this regard. He says that as a matter of fact the railway's capital requirements are comparatively small and should easily be provided for in the manner indicated. The officers of the company consider this feature of the plan of great importance as it promises to the public more dependable and adequate service and to the holders of railway securities sounder credit and enhancement of value.

In short, as has been indicated previously, the plan is designed to furnish the vast sums of new money required by the company for the adequate performance of its functions.

In connection with the plan the corporation has arranged to issue 200,000 more shares of no par value common stock, of which 100,000 is to be issued at once and the remainder later on. Stockholders of record of March 21, 1924, will have the privilege of subscribing to the new stock at $44 a share for each nine shares now held, either common or preferred. For each one share now subscribed for of the first 100,000 shares, the subscriber will have the option of subscribing for an additional one share of the second 100,000 shares on the same basis as the first 100,000 shares. There are now outstanding 600,000 shares of common stock, 215,086 shares of 8 per cent cumulative preferred stock and 87,200 shares of 7 per cent cumulative preferred stock.

Reported Kansas Power & Light Includes McKinley Interest

The Topeka Railway, Topeka Edison Company, Wichita Railway & Light Company and the Atchison Light & Power Company, all in Kansas, are to be taken over by the Kansas Power & Light Company. The new company has an estimated authorized capital of $11,250,000, divided as follows: 50,000 shares of preferred stock, par $100 a share; 75,000 shares of no-par stock with an estimated value of $50 a share; 25,000 shares of no-par stock with an estimated value of $100 a share. The directors of the new corporation include A. M. Patten, T. F. Doran, Clayton Kline, A. H. Purdy, W. D. Cole, A. W. Freeman, K. H. Losey, G. W. Thompson, and G. W. Miller. The company has applied to the Public Utilities Commission for permission to issue $5,413,000 in bonds for refunding and other purposes.

Denver Tramway Offers to Extend Bonds

The Denver Tramway, Denver, Col., has offered to extend further the bonds due on April 1, 1924, for three years with tax-free convenants and present existing liens, with interest at 6 per cent. The plan has the approval of the receiver and authority of the United States District Court for Colorado.

On the $2,000,000 Denver City Tramway first mortgage, extended 6s, the company reserves the right to redeem the whole issue at 101 and interest upon any interest date upon thirty days notice. On the $741,000 Denver Tramway Power Company first mortgage improvement extended 6s the receiver has been authorized to deposit $50,000 with the International Trust Company, Denver, to be used to redeem the extended bonds at 105, as drawn by lot. The extension is asked because the fare to be charged by the company is a matter for court consideration and the reorganization has been postponed. The company with the court approval reserves the right to withdraw this privilege on or before May 1, 1924.

$51,761,348 Value Accepted for St. Louis Property

Receiver Rolla Wells and the board of the United Railways, St. Louis, are said to have decided to accept the valuation of $51,761,348 placed upon the company's physical property by the Missouri Public Service Commission on June 4, last, and to drop the appeals against that decision now pending in the St. Louis and Cole County Circuit Courts. The decision is expected to aid materially the reorganization of the company.

The company had contended for a valuation of $70,000,000 while the city of St. Louis through special counsellor Henry S. Caulfield at one time contended for a valuation as low as $29,805,975. The last arguments on the valuation were made before the state commission in February.

While this valuation of $51,761,348 covers amply the present bonded debt of the company, it would appear to leave little for the $16,383,000 of 5 per cent cumulative preferred stock outstanding, though the additions to the property value since 1919 may make provision for several millions of this stock, it is stated.

On Saturday, March 15, arguments were heard before Former Supreme Judge Fred L. Williams, temporary special master, in St. Louis in the foreclosure suit of the St. Louis & Suburban Railway bondholders against the United Railways. The bondholders are seeking to have the St. Louis & Suburban property segregated from the remainder of the United Railways. The St. Louis & Suburban System was taken over by the United Railways in 1906.

The Suburban bondholders opposed the application of Receiver Rolla Wells for permission to spend $1,065,000 for new equipment and trackage extensions. Judge Williams finally took the matter under advisement after two hours of arguments by counsel for the St. Louis & Suburban Railway bondholders, Receiver Wells and the United Railways.

The receiver desires to spend $1,050,000 in constructing 100 new side-door-exit cars and $15,000 for double-tracking the St. Charles line from St. John's station to Woodson Road.

	Latest	Month Ago	Year Ago	Since War	
				High	Low
Street Railway Fares* 1913 = 4.84	Mar. 1924 **6.93**	Feb. 1924 **6.93**	Mar. 1923 **6.83**	May 1921 **7.24**	May 1923 **6.88**
Street Railway Materials* 1913 = 100	Feb. 1924 **163**	Jan. 1924 **159**	Feb. 1923 **174**	Sept. 1920 **247**	Sept. 1921 **156**
Street Railway Wages* 1913 = 100	Mar. 1924 **219**	Feb. 1924 **219**	Mar. 1923 **207**	Sept. 1920 **232**	Apr 1923 **207**
Steel—Unfilled Orders (Million Tons) 1913 = 5.91	Feb. 29 1924 **4.91**	Jan. 31 1924 **4.80**	Feb. 28 1923 **7.28**	July 31 1920 **11.12**	Feb. 28 1922 **4.14**
U.S. Bank Clearings Outside N. Y. City (Billions)	Feb. 1924 **14.71**	Jan. 1924 **16.14**	Feb. 1923 **13.71**	Mar. 1920 **18.54**	Feb. 1922 **10.65**
Business Failures	Feb. 1924	Jan 1924	Feb. 1923	Jan. 1924	Sept. 1923
Number	**1,578**	**2,258**	**1,563**	**2,258**	**1,280**
Liabilities (millions)	**73.75**	**109.1**	**38.15**	**109.1**	**27.50**

Conspectus of Indexes for March, 1924

Compiled for Publication in this Paper by

Albert S. Richey
Electric Railway Engineer
Worcester, Mass.

	Latest	Month Ago	Year Ago	Since War	
				High	Low
Eng. News-Record Construction costs 1913 = 100	Mar. 1924 **224.7**	Feb 1924 **220.3**	Mar. 1923 **205.2**	June 1920 **273.8**	Mar. 1922 **162.0**
U.S. Bur. Lab. Stat. Wholesale Commodities 1913 = 100	Feb. 1924 **152**	Jan. 1924 **151**	Feb. 1923 **157**	May 1920 **247**	Jan. 1922 **138**
Bradstreet's Wholesale Commodities 1913 = 9.21	Mar. 1 1924 **12.90**	Feb. 1 1924 **13.20**	Mar. 1 1923 **13.93**	Feb. 1 1920 **20.87**	June 1 1921 **10.62**
Dun's Wholesale Commodities 1913 = 120.9	Mar. 1 1924 **190.7**	Feb. 1 1924 **191.1**	Mar. 1 1923 **191.2**	May 1 1920 **263.3**	July 1 1921 **159.8**
U.S. Bur. Lab. Stat. Retail food 1913 = 100	Feb. 1924 **147**	Jan. 1924 **149**	Feb. 1923 **142**	June 1920 **219**	Mar. 1922 **139**
Nat. Ind. Conf. Bd. Cost of living 1914 = 100	Feb. 1924 **163.9**	Jan. 1924 **164.6**	Feb 1923 **157.5**	July 1920 **204.5**	Aug. 1922 **154.5**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population.

Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen and conductors on 105 street and interurban railways in the United States, operating more than 100 passenger cars each, and weighted according to number of cars.

Indiana Interurban Has Net Income of $73,336

The net income of the Union Traction Company of Indiana for 1923 shows a surplus of $73,336 compared with a surplus of $210,163 in 1922, a decrease of $136,827. Differences in the treatment of depreciation charges for 1923 and 1922 account partly for this decrease. Computation of 1923 depreciation on the 1922 basis would increase the 1923 net income to $129,453. Financial conditions compelled the passing of sinking fund payments during the year. The deduction of 1923 sinking fund charges would make the balance for the year $4,936.

STATEMENT OF EARNINGS OF THE UNION TRACTION COMPANY OF INDIANA

	1923	1922
Revenue from transportation	$3,745,715	
Revenue other than from operation	144,974	
Total operating revenue	$3,890,689	$3,835,747
Total operating expenses	2,647,123	2,459,744
Net operating revenue	$1,243,566	$1,376,003
Taxes	257,409	264,000
Net revenue less taxes	$986,156	$1,112,003
Other income	30,998	15,337
Gross income	$1,017,155	$1.127,340
Bond and other interest, etc.	943,819	917,176
Net income	$73,336	$210,164

In the operating expenses for the year are included $534,896 for maintenance of way and structures and $320,058 for maintenance of car equipment, making the total sum charged in these directions for maintenance of the property $854,954. This sum equals 21.98 per cent of the gross operating revenue for the year, equivalent to $2,056 per mile of single main track operated, exclusive of city tracks of other companies at Indianapolis, Logansport and Wabash. The 1922 figures for the same purposes were $787,709, equal to 20.54 per cent of gross operating revenue, or $1,893 per mile of single main track operated.

During the year $323,158 was expended for additions and betterments to the company's property and $66,199 was expended for extensions and betterments to the property of the Traction Light & Power Company, owned by the company. The 1922 figures for like purposes were $257,055 and $25,295. There was also included in the expenditures of 1923 the net sum of $32,330 representing additions to property of the Traction Land Company, owned by the Union Traction Company and used to help finance the purchase of real estate required for company purposes.

One of the principal expenditures for additions was for the purchase of twenty-three safety cars, financed in part by an issue of $63,720 car trust notes payable serially during a three-year period, of which $17,700 was paid in 1923. The system comprises 453 miles of track.

Discontinuance Asked.—The Public Service Railway has asked permission of the Board of Public Utility Commissioners to discontinue railway service from Gloucester to Fairview, N. J. If the application is granted the company will remove the tracks and increase bus service between the two towns.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

$2,500,000 Issue Offered.—E. H. Rollins & Sons, New York, are members of a syndicate which is offering for subscription at 99½ and interest to yield 6.05 per cent $2,500,000 of Key System Transit Company 6 per cent first mortgage gold bonds, Series A. The proceeds from the sale of the bonds will be used to reimburse the treasury of the company for capital expenditures already made and to pay for the cost of additions and betterments to its plant and equipment.

Directors Chosen.—Directors were chosen at the recent meeting of the stockholders of the New York State Railways in Rochester for the Rochester Railways Co-ordinated Bus Lines., Inc., as follows: Daniel M. Beach, Albert H. Harris, Willis A. Matson, Alfred H. Smith, and James F. Hamilton. This subsidiary operates the trackless trolley line and Greece bus route in Rochester.

Prior Preferred Dividend Passed.—Directors of the Market Street Railway, San Francisco, voted on March 14 to omit the 1½ per cent, quarterly dividends on the prior preference stock. It is understood that the decision was based on the opinion that the payment would be unwise in view of the recent large refunding operations and the retirement of more than $500,000 of funded debt.

New Data for Sale.—The receiver for the defunct Pennsylvania & Ohio Traction Company, Ashtabula, Ohio, recently announced that another effort would be made to dispose of the property at public auction on April 7, at the courthouse in Jefferson. A sale was advertised for Jan. 28, but no bids were made. If no bids are made at the coming sale it is reported the receiver will ask for a reappraisal.

Interurban Line Sold.—Representatives of the security holders bought the Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, at foreclosure sale on March 14 for $4,605,000. The property includes 202 miles of track. The company has outstanding $4,236,000 of common stock and $2,413,000 of 5 per cent cumulative preferred stock. The property was put into receivership on Jan. 20, 1922, on petition of the General Electric Company.

Canadian Road Floats Issue in London.—The British Columbia Electric Railway, Vancouver, B. C., is reported to be floating an issue of £750,000 of 5 per cent debentures in the London market. They are redeemable in 1934 at 95.

Wants Company to Operate.—Just as soon as the Colorado Springs & Interurban Railway, Colorado Springs, Col., announced the plan proposing the discontinuance of its service from the Springs to Roswell, a suburb, the suburbanites drew up a petition asking the Public Utilities Commission to force the company to operate its electric cars.

Applies for Abandonment.—Competition of buses was blamed for the decision of the DeKalb-Sycamore & Interurban Traction Company of Illinois to cease operations. An application for permission to quit business was filed with the Illinois Commerce Commission at Springfield on March 14. The interurban operates between DeKalb and Sycamore.

Appraisers Named.—G. E. Scott and M. G. Irvin, Norwalk, and A. V. Brown, Sandusky, have been named appraisers of the Norwalk-Shelby Railway, now in the hands of receivers and about to be ordered sold to satisfy mortgages.

Reorganization Effective.—Following the retirement of Ives & Davidson, New York City, as operating managers of the Mauch Chunk & Lehighton Transit Company, Mauch Chunk, Pa., a reorganization took place on March 10. A new board of directors was elected by the stockholders. The officers chosen are: President, V. M. Walff; vice-president and general manager, H. T. Ely; treasurer, G. H. Myers, and secretary, H. O. Probst. The company owns and operates the electric railway in Mauch Chunk, East Mauch Chunk and Upper Mauch Chunk also an interurban line to Lehighton.

Seeks Partial Abandonment.—The Union Traction Company, Santa Cruz, Cal., has applied to the Railroad Commission for authority to abandon operations upon Soquel, formerly Minnesota Avenue, from Front Street to Pacific Avenue, and those portions of its system extending respectively to La Veaga Park, Seabright and Capitola.

Gold Bonds Offered.—A syndicate including A. C. Allyn & Company, Inc., New York, is offering at 96¾ and accrued interest to yield about 6.80 per cent $880,000 of the North Carolina Public Service Company, Inc., first lien and refunding mortgage 6½ per cent gold bonds. The bonds, known as Series "A," are dated Feb. 1, 1924, and are due Feb. 1, 1944. This company is a consolidation of properties as noted in the ELECTRIC RAILWAY JOURNAL for March 8.

Gold Bonds Offered.—Howe, Snow & Bertles, New York, are offering at 95 and interest to yield 6.90 per cent, $800,000 of first lien and refunding 6½ per cent gold bonds of the Central Power & Light Company, known as the "1952" Series. The bonds are dated Sept. 1, 1922, and are due Sept. 1, 1952. The company operates directly or through its subsidiaries thirty-four central electric power stations as well as doing a gas, water, railway or ice business in fifty cities and towns in eleven different groups. The proceeds from this additional offering will be used to cover part of the expenditure for improvements on the Texas Central Power group and other properties located in Texas.

Separate Company for Railway at Ottumwa.—The Ottumwa Traction Company, Ottumwa, Iowa, incorporated in Delaware in January, has taken over the railway properties formerly included in the system of the Ottumwa Railway & Light Company. This is a change in the interest of simplification of intercorporate relations and does not involve any change with respect to the control of the properties by the Byllesby interests and the Northern States Power Company.

Personal Items

Fred C. Marston Appointed B.-M. T. Secretary

Fred C. Marston, who recently resigned as a vice-president of the Irving Bank-Columbia Trust Company, has been elected secretary and treasurer of the Brooklyn-Manhattan Transit Corporation. Mr. Marston is the first man to hold this post since the company was reorganized from the old Brooklyn Rapid Transit, the new corporation having up to this time had no secretary and treasurer.

Mr. Marston joined the original Columbia Trust Company before its amalgamation with the Irving Bank, in 1905. He became assistant secretary in 1908 and rose from then on until he became vice president, a post which he held until his resignation.

S. E. Boney Made Director of Carolina Information Bureau

S. E. Boney, Philadelphia, has been named by the executive committee of the newly organized North and South Carolina Public Utility Information Bureau as the director of the bureau. He has had an experience of eighteen years in the newspaper field. Mr. Boney has served with the Union (S. C.) *Times*, the Laurens (S. C.) *Advertiser* and the *News and Courier* of Charleston, S. C. For the past ten years he has been with the *Public Ledger*, Philadelphia. His most recent position was city editor of both the *Public Ledger* and the *Evening Public Ledger*. Mr. Boney is a native of South Carolina, in which state he is widely acquainted.

Ben S. Allen Appointed to Key System Transit Company

Ben S. Allen has been made manager of the recently created public relations department of the Key System Transit Company, Oakland, Cal. Mr. Allen took his degree in history at Stanford in 1907. He served on several San Francisco newspapers as reporter until 1908, when he joined the San Francisco bureau of the Associated Press. He was transferred East, and after serving for a short time in New York and Washington offices of the Associated Press he was sent to the London bureau, where he acted as outside man for seven years. During the first three years of the World War Mr. Allen covered many of the big stories coming under the jurisdiction of the London office. He was one of the seven men invited to Herbert Hoover's office for the purpose of forming the Commission for Relief of Belgium, and thereafter, as a volunteer, directed the publicity of that great relief organization. When the United States entered the war Mr. Allen returned to this country with Mr. Hoover and, with the creation of the Food Administration, he became director of its educational division. He was also publicity advisor of the Fuel Administration and the War Trade Board. Returning to California at the close of the war, he became the publisher of the Sacramento *Union*, a position he held for two years. He then started a national educational campaign designed to inform consumers about the operations of the California farmers' co-operative marketing associations. Later he reentered the newspaper field as publisher of the *California Farmer*, one of the leading farm journals of the Pacific Coast.

C. C. Coates Promoted

C. C. Coates was recently promoted from assistant railway superintendent to the position of railway superintendent of the Pacific Northwest Traction Company and Puget Sound International Railway & Power Company, in Everett, Wash. He entered the employ of Stone & Webster in 1907, in the sales department of the Whatcom County Railway & Light Company at Bellingham. He was later transferred to the accounting department, continuing in that work until July, 1917, when he was appointed to the position of assistant railway superintendent in Everett.

C. C. Coates

A. A. Wilson, formerly general agent of the Chicago, Milwaukee & St. Paul Railroad at Denver, has been appointed traffic manager of the Salt Lake & Utah Railroad, with headquarters at Salt Lake City, Utah. Mr. Wilson succeeds A. V. Kipp, who resigned last October to become assistant general freight agent of the Oregon Short Line Railroad. Mr. Wilson has been identified with the Chicago, Milwaukee & St. Paul Railroad for the past twenty-seven years and has worked in various capacities in the traffic department. He began his railroad career as a telegraph operator and worked up to division freight and passenger agent in Iowa. He was later promoted to assistant general freight agent at Chicago and then to general agent of the line at Denver.

H. E. Blain Political Organizer

H. E. Blain, assistant managing director of London Underground Railways and the London General Omnibus Company, has been appointed chief agent of the British Conservative (or Unionist as it is sometimes still called) Organization, in succession to Admiral Sir W. Hall, retired. Mr. Blain, though a conservative, has never actively concerned himself in political affairs, but he has a great reputation as an organizer, and it is as an organizer that he is expected to prove of greatest value to the Conservative party. Years ago he was principal traffic assistant on the Liverpool Corporation Tramways. In 1903 he became tramway manager to West Ham Corporation. Ten years later he left West Ham and joined the London Underground Railway and bus combine as purchasing agent. In 1914 he became operating manager, and in 1921 assistant managing director. Mr. Blain was president of the Municipal Tramways Association in 1910-11. He achieved independent note as the founder and first chairman of the London Safety First Council and founder and vice-president of the British Industrial Safety First Association. To this movement for the prevention of accidents he has devoted his energies with great success. In fact, he may be said to have called it into being in England, and now it is an elaborate organization. The Conservative party evidently considers that in him it has found the man it wants. He is not tied up with a political past, and is free to devote his organizing abilities to the improvement of the party electoral machine.

New Appointments at Pittsburgh

Several new appointments in the newly reorganized Pittsburgh Railways, Pittsburgh, Pa., have been announced, as follows:

C. C. Gillette has been appointed traffic agent.

J. E. Davis has been appointed special investigator.

F. R. Cogswell has been appointed director of traffic promotion.

J. B. Donley has been appointed director of public relations.

All these officers have their headquarters in the Central Office Building, in Pittsburgh. The appointment became effective March 1.

A. W. Leonard, president of the Puget Sound Power & Light Company, Seattle, Wash., has been elected president of three of the subsidiary companies of the corporation: The Puget Sound Electric Railway, operating the Seattle-Tacoma electric interurban; the Tacoma Railway & Power Company, operating the Tacoma street railway system, and the Pacific Northwest Traction Company, operating the Mount Vernon-Bellingham interurban. Mr. Leonard succeeds Frederick D. Pratt in the presidency of the three companies, while Mr. Pratt becomes chairman of the board of directors in each instance. The company does most of the commercial electric lighting and power business in the Puget Sound District and Western Washington and substantially all the electric street and interurban business there except in Seattle.

P.R.T. Official Changes

Changes have recently been announced in the designation of the personnel of the Philadelphia Rapid Transit Company as follows: R. F. Tyson has been advanced from operating manager of the elevated railway to vice-president in charge of operation. G. C. Haney succeeds Mr. Tyson as manager of the elevated. H. C. Heaton has replaced George B. Taylor as engineer of way. B. J. Yungbluth will continue as supervisor of materials and supplies but will take on new duties as assistant vice-president of finance and accounting.

Fred P. Snyder, for several years in charge of the shops of the Oakwood Street Railway, Dayton, Ohio, has been appointed superintendent of transportation and equipment.

William A. Jackson, who has been at the head of the legal department and legislative counsel of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., for the last nine years, has been elected a vice-president of the company, according to S. B. Way, vice-president and general manager of the company. Before going to the Milwaukee company, Mr. Jackson was associated with the North American Company.

Frederick L. Farr, formerly specialist in public utility securities for Moody's Investors Service, has joined the staff of Stevens & Wood, Inc., who finance and manage utility and industrial properties.

Obituary

R. K. Willman, formerly president of the Citizens' State bank and a director of the Union Traction Company of Indiana, Anderson, died recently at Hartford City, Ind.

E. F. J. Gaynor, auditor of the Interborough Rapid Transit Company, New York, N. Y., is dead. He had been connected with the company and its predecessors more than forty-six years. In 1903 when the Manhattan Railway lines were leased by the Interborough Rapid Transit Company Mr. Gaynor was appointed auditor of the latter company. Prior to that he had been auditor of the Manhattan Railway.

Five Cents in Kenmore

Under an agreement between officials of the Northern Ohio Traction & Light Company, Akron, and the city of Kenmore a 5-cent fare with penny transfers will become effective in Kenmore. Formerly Kenmore had a 5-cent rate with free transfers, as did Akron under the terms of the old Akron franchise, which expired Feb. 1. Since that time the fare between Kenmore and Akron has been 7 cents.

Though under a separate city government, N. O. T. Officials desired to give the community the same fare rate as prevails in Akron.

The new rate will be effective as soon as permission to put it in effect is received from the State Public Utilities Commission.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Railways Buy Many Fageols

During the first sixty days of 1924 the Fageol Motors Company received orders from electric railways in the United States equal to more than half of the entire purchases of Fageols by railways in 1923. Most of these orders were placed by companies already operating this type of motor vehicles. Among the recent orders are the following:

Pacific Electric Railway, Los Angeles, Cal	20
Los Angeles Railway, Los Angeles, Cal	20
San Diego Electric Railway, San Diego, Cal	10
Public Service Company, San Antonio, Tex	6
Milwaukee Electric Railway & Light Company Milwaukee, Wis	5
Trenton & Mercer County Traction Company, Trenton, N. J	10
Public Service Railway, Newark, N. J	25
United Electric Railways, Providence, R. I	3
Connecticut Company, New Haven, Conn	2
Day & Zimmermann, Public Utility Engineers, Philadelphia, Pa. (for operation in Ohio)	6

The question of delivery is becoming a serious one and orders for new coaches are now being accepted for June and July delivery. Plans for factory production in the East, however, are maturing rapidly.

It is the belief of the Fageol Motors Company that transportation is a natural monopoly subject to regulation. For that reason the company desires to encourage the purchase of Fageol coaches by the existing transportation agencies before endeavoring to develop other fields. Under no circumstances is it contemplated by the Fageol Motors Company that it should engage in the actual operation of coaches. A staff of engineers has been organized and their services are at the disposal of electric railways operating or contemplating the operation of buses. Coordinated service has been successfully worked out by several railways working in conjunction with these engineers.

Use of Variable Load Brake Is Being Extended

The recent receipt by the Westinghouse Air Brake Company of an order for the installation of variable load brakes or single-truck cars indicates a probable further extension of the use of this device. During the past two years the variable load brake has been used by street railways to an increasing extent. This attachment has the same purpose as a similar attachment added to the automatic brakes on the cars first placed in service in the Brooklyn subway in 1915. Inasmuch as surface cars do not have automatic brakes, however, the variable load attachment has been somewhat modified.

The extensive introduction of light-weight cars in city service emphasizes the need for such a device. The first property to make a large installation was the Boston Elevated, which now has more than 300 surface cars equipped in this way. The Eastern Massachusetts Street Railway, Brooklyn City Railroad, Connecticut Company, Massachusetts Northeastern Street Railway, United Railways & Electric Company of Baltimore, Union Street Railway, New Bedford, Mass. and others have equipment in service or on order. To date orders have been received for nearly 710 equipments for surface cars and about 1,000 attachments for automatic subway brakes.

Good Demand for Differential Dump Cars

Six different electric railways have recently placed orders with the Differential Car Company for dump cars and dump car trains. Of the cars ordered eight will be equipped with motors and two will be trail cars. The companies placing these orders and the type of car desired follow:

DETAILS OF RECENT DUMP CAR PURCHASES

Name of Company	No. of Cars	Type	Capacity	Motors
Tri City Railway, Davenport, Iowa	2	Motor	20 cu.yd.	GE 80-A
Memphis Street Railway, Memphis, Tenn	1	Motor	20 cu.yd.	GE 201-I
Memphis Street Railway, Memphis, Tenn	1	Trailer	20 cu.yd.	
Market Street Railway, San Francisco, Cal	2	Motor	18 cu.yd.	Bodies only
Omaha & Council Bluffs Street Railway, Omaha, Neb	1	Motor	18 cu.yd.	4 GE 80-A
New York State Railways, Syracuse, N. Y	1	Motor	....	4 GE 90
New York State Railways, Syracuse, N. Y	1	Trailer	....	....
Cincinnati Traction Co., Cincinnati, Ohio	1	Motor	....	4 Westinghouse 93

A majority of these dump cars are of the recently developed door-chute design.

Metal, Coal and Material Prices

Metals—New York	March 18, 1924
Copper, electrolytic, cents per lb	13.625
Copper wire base, cents per lb	16.375
Lead, cents per lb	9.00
Zinc, cents per lb	6.74
Tin, Straits, cents per lb	53.50
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.675
Somerset mine run, Boston, net tons	2.375
Pittsburgh mine run, Pittsburgh, net tons	2.125
Franklin, Ill., screenings, Chicago, net tons	2.00
Central, Ill., screenings, Chicago, net tons	1.70
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft	$6.75
Weatherproof wire base, N.Y., cents per lb	18.00
Cement, Chicago net prices, without bags.	$2.20
Linseed oil (5-bbl. lots), N. Y., per gal	$0.95
White lead, in oil (100-lb. keg), N.Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal	$1.02

Officers of Johns-Manville Company Advanced

At a recent meeting of the board of directors of Johns-Manville, Inc., New York, the following officers were elected:

T. F. Manville, chairman of the board; H. E. Manville, president; L. R. Hoff, vice-president and general manager; W. R. Seigle, vice-president and general manager of the factory and mines; J. E. Meek, vice-president; J. W. Perry, vice-president; J. S. Carroll, vice-president; A. C. Hoyt, secretary and treasurer, and T. F. Manville, Jr., assistant secretary and treasurer.

The position of chairman of the board is a new office, to which T. F. Manville, formerly president and treasurer, has succeeded, while H. E. Manville, formerly vice-president and secretary, has been elected president.

James W. Perry, who was elected a vice-president of the company, is general manager of the electrical, automotive and public utilities departments. He has been connected with Johns-Manville since 1889. Mr. Perry is treasurer and a director of the Electrical Manufacturers' Council, a director of the Electrical Manufacturers' Club and has always been active in the work of the N.E.L.A., in which for five years he served as chairman of the exhibit committee. He is also a member of the American Electric Railway Association.

Foreign Trade Convention in Boston in June

The National Foreign Trade Convention will be held at Boston, June 4, 5 and 6, next. This is the first time the convention has been held in New England. The central theme of the convention will be "Our Need for Wider Markets."

This is also the first time that a session specially devoted to the interests of importers has been included in the program. It will be held in cooperation with the National Council of American Importers and Traders.

In sending the call for the convention James A. Farrell, president of the United States Steel Corporation and chairman of the National Foreign Trade Council, has cordially invited all chambers of commerce, boards of trade, national and state associations and other industrial and commercial organizations to be represented. He says that the present foreign trade situation of the United States offers an inspiration and encouragement to American foreign traders.

Rolling Stock

Binghamton Railway, Binghamton, N. Y., has decided as a result of a six months' test begun in July, 1923, to equip thirty-seven one-man cars with the Simplex Safety system.

Indiana Service Corporation, Fort Wayne, Ind., has recently ordered from the St. Louis Car Company fifteen double truck one-man cars for city operation. These cars are of the same design and construction as the fifteen cars received in October of last year. They will have double doors at the front for entrance and exit and an exit door at the rear.

Hartford & Springfield Street Railway, Warehouse Point, Conn., is negotiating for two buses.

New Orleans Public Service, Inc., New Orleans, La., recently ordered six new car bodies from the Perley A. Thomas Car Works, High Point, N. C. Delivery is to be made in ninety days. The type of body is the same as previously ordered by the Public Service Company.

United Railways, St. Louis, Mo., through its receiver is desirous of spending $1,050,000 in the construction of 100 new side-door-exit cars.

Des Moines City Railway, Des Moines, Iowa, plans the purchase of new equipment at a cost of $169,000. Three new cars are included in the purchase.

Michigan Railroad, Jackson, Mich., has placed an order for fifteen new steel frame freight trail cars and two freight motor cars.

Track and Line

Montreal Tramways, Montreal, Que., is preparing a program of extensions and improvements which will involve an expenditure of $1,500,000. A considerable part of the program consists of replacements and repairs. A new line to be constructed this year is that to give access to the top of Mount Royal. The line will be ready for operation this summer. The Iberville Street line will also be extended this season.

Community Traction Company, Toledo, Ohio, it is expected will undertake considerable track construction this summer.

Des Moines City Railway, Des Moines, Iowa, expects to submit to the city administration an improvement and extension plan which will involve the expenditure of more than $500,000. The plan includes the extension of the Sixth Avenue and Oak Park line, extension of the Sixth Avenue and Highland Park line and the extension of the Clark Street line. In addition to these improvements, the company proposals call for new tracks and paving on University Avenue at a cost of $13,622, new tracks and paving on Clark Street at a cost of $19,818 and other new tracks and paving work at a cost of $76,577. The company also plans to construct a new wye at a cost of $5,280, a new passing track and new crossovers where residents have complained of noise from the present equipment, at a cost of $3,600. The total cost of the company's proposed plan in 1924 is $717,505.

Trade Notes

Morton Manufacturing Company, Chicago, Ill., announces the appointment of the Consolidated Equipment Company, with offices at 260 St. James Street, Montreal, as its exclusive and direct representative covering the sale of its Acme line of railway appliances throughout Canada.

Mica Insulator Company, New York, N. Y., recently elected new officers. L. W. Kingsley became chairman of the board; Edward T. Wood, president, and Edward Nelson secretary and treasurer. These men have for a long time been identified with the Mica Insulator Company. The company has factories in both America and England, securing its mica direct from the mines.

New Advertising Literature

Yale & Towne Manufacturing Company, Stamford, Conn., has issued a 100-page catalog-handbook of hoisting and truck equipment. This catalog, "21-M," contains much engineering information, including a signed article by Henry R. Towne on chain block efficiency. A brief outline of the new line of Yale trucks is incorporated. The book is not for quantity distribution, but will be sent to all ELECTRIC RAILWAY JOURNAL readers making written request for a copy on their letterheads.

General Electric Company, Schenectady, N. Y., has recently issued the General Electric Review, containing a reprint from the issue of February, 1924, of an article by W. D. Bearce entitled "Epoch-Making Tests on New Passenger and Freight Locomotives." The pamphlet is illustrated.

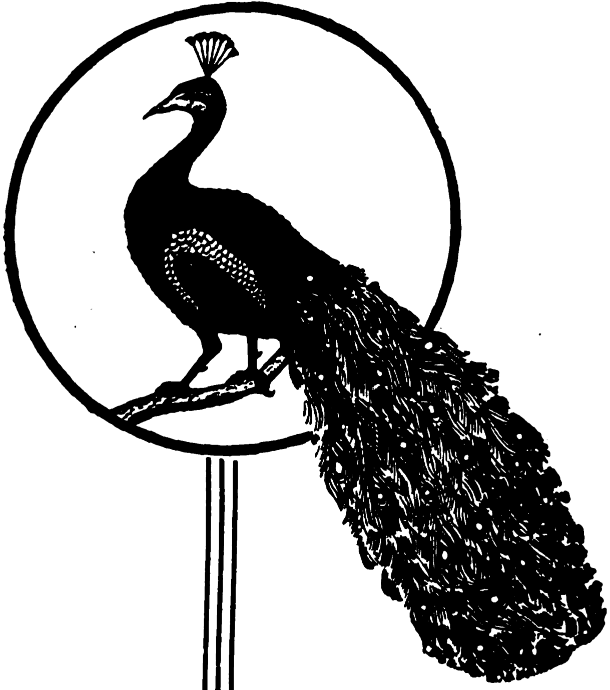
Bethlehem Steel Company, Bethlehem, Pa., has issued an illustrated thirty-page pamphlet on Bethlehem twin-span turntables. The development of the turntables to meet the requirements of present day railroad terminal facilities is reviewed in this pamphlet.

The Electric Power Club, Cleveland, Ohio, gives important new rules on preferred ratings and system voltages for distribution transformers, standards for single-phase and three-phase step-up power transformers, the adoption of outdoor construction as standard, in the third edition of "Transformer Standards," just issued by the transformer section of the club. The new edition also contains lead markings and vector diagrams, polarity connections, standard ratings, performance specifications, tests, methods of measuring losses and temperature and all other material which appeared in the previous edition. This is a publication of forty pages and it may be obtained from manufacturers of power and distribution transformers or from the Electric Power Club, B. F. Keith Building, Cleveland.

The Field and Future of the Motor Bus has been reprinted in pamphlet form. It was the subject of a paper presented by J. A. Emery, vice-president, Ford Bacon & Davis, Inc., before the Society of Automotive Engineers at Detroit, Mich., on Jan. 24. The speech was printed in the Feb. 24 issue of *Bus Transportation*.

Triumph Electric Company, Cincinnati, Ohio, announces the issuance of a complete revision of prices, covering its entire line of motors, both a.c. and d.c., 1 to 250 hp. This price book will be issued to any user of motors who has not yet received a copy.

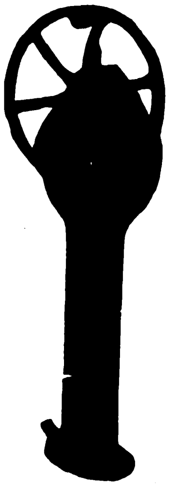
PEACOCK
STAFFLESS BRAKES



Familiar equipment to the experienced motorman—

Inspire motormen's confidence, in the equipment they handle. Confidence, in the time of necessity that their equipment will back them up in actual performance. Many roads recognize the importance of this phase of operation. They have a regular schedule of hand-brake stops on every route. Incidentally it is particularly noticeable that most of these companies are Peacock equipped.

Peacock Brakes are familiar equipment to the experienced motorman.



"The Peacock Staffless"

National Brake Company, Inc.
890 Ellicott Square, Buffalo, N. Y.
Canada:—Lyman Tube & Supply Co., Ltd., Montreal

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

The J. G. White
Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants.
Steam and Electric Railroads, Buildings and
Industrial Plants, Transmission Systems.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation
Management
52 Vanderbilt Ave., NEW YORK

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation,
Studies on Financial and Physical Rehabilitation
Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

J. ROWLAND BIBBINS
Engineer—927 Fifteenth St., WASHINGTON
TRANSPORTATION SURVEYS
Organized Traffic Relief and Transit Development
Co-ordinating Motor Transport, Railroad and City
Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINCKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND NEW YORK
1570 Hanna Bldg. 84 Pine St.

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

The Most Successful Men in the Electric Railway
Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

AMERICAN BRIDGE COMPANY
EMPIRE BUILDING, 71 BROADWAY, NEW YORK

Manufacturers of Steel Structures of all classes, particularly
BRIDGES AND BUILDINGS

SALES OFFICES:

NEW YORK, N. Y. . Empire Bldg., 71 Broadway
Philadelphia, Pa., Widener Bldg., N. W. Cor. Chestnut and Juniper Sts.
Boston, Mass. . . . . 120 Franklin St.
Baltimore, Md., Continental Bldg., Cor. Calvert and Baltimore Sts.
PITTSBURGH, PA. . Frick Bldg., 440 Fifth Ave.
Cincinnati, Ohio . Union Trust Bldg., 36 East 4th St.
Cleveland, Ohio . Guardian Bldg., 629 Euclid Ave.
Detroit, Mich. . . Beecher Ave. and M. C. R. R.
CHICAGO, ILL. . . . 208 South LaSalle St.
St. Louis, Mo., Liberty Central Trust Bldg., 506 Olive St.
Denver, Colo., First National Bank Bldg., 820 17th St.
Salt Lake City, Utah, Walker Bank Bldg., 175 S. Main St.
Duluth, Minn. . Wolvin Bldg., 229-31 West 1st St.
Minneapolis, Minn. . . 629 2nd St., S. E.

Pacific Coast Representative:
U. S. Steel Products Co., Pacific Coast Dept.

San Francisco, Cal., Rialto Bldg., 116 New Montgomery St.
Portland, Ore. . . Selling Bldg., 322 Adler St.
Seattle, Wash. . . 4th Ave. So., Cor. Conn. St.

Export Representative: United States Steel Products Co., 30 Church St., N. Y.

Transmission Line and Special Crossing Structures, Catenary Bridges
WRITE FOR OUR NEW DESCRIPTIVE CATALOG
ARCHBOLD-BRADY CO.
Engineers and Contractors SYRACUSE, N. Y.

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. **Richmond, Va.**
Established Feb. 1913.

The Most Successful Men in the Electric Railway Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

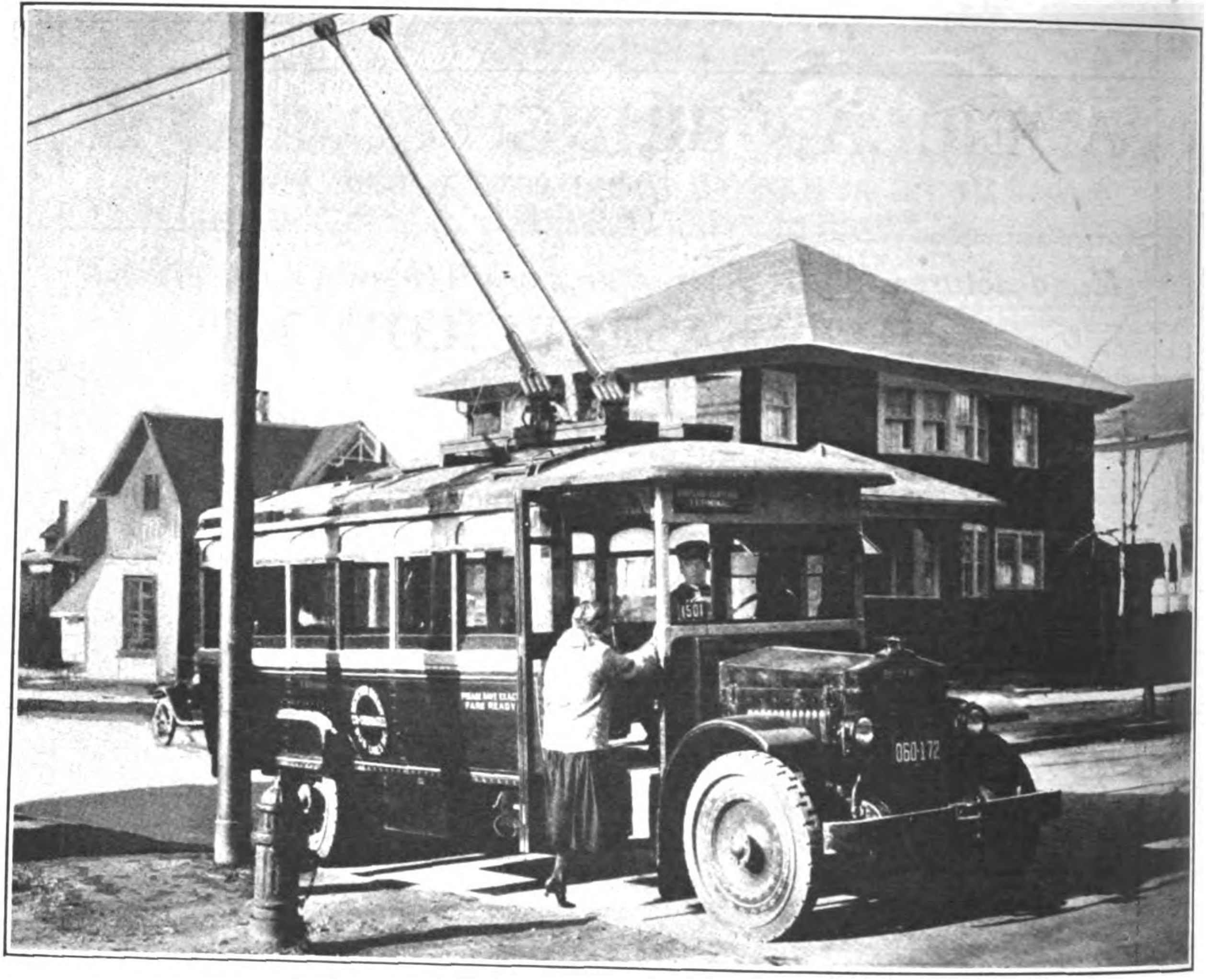
C. B. BUCHANAN, President W. H. PRICE, JR., Sec'y-Treas. JOHN F. LAYNG, Vice-President
BUCHANAN & LAYNG CORPORATION
Engineering and Management, Construction, Financial Reports, Traffic Surveys and Equipment Maintenance
BALTIMORE 825 Equitable Bldg. Phone: Hanover 2142 NEW YORK 49 Wall Street

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

THE P. EDWARD WISH SERVICE
50 Church St. NEW YORK *Street Railway Inspection* DETECTIVES 131 State St. BOSTON

Byllesby
Engineering & Management
Corporation
208 S. La Salle Street, Chicago
New York Tacoma

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.



One of nine Brockway Trackless Trolleys operated by New York State Railways, Rochester, N. Y.

On the score of maintenance—

the trackless trolley is the logical "feeder" for electric railways

In the first place the installation cost of a trackless trolley line is infinitely less than the extension of tracks—and indeed very little more than that of gasoline buses.

In the second place, this higher cost, compared with buses, is soon offset by the very substantial savings in maintenance which can be effected in trackless trolley operation by an already established electric railway.

The same barns; the same mechanics; even the same parts and equipment, that are already on hand for car maintenance, apply equally well to trackless trolleys.

We'll be glad to co-operate in proving how economically you can plan profitable "feeder" lines of trackless trolleys where hitherto the cry has been "last stop!"

Investigate

The BROCKWAY TRACKLESS TROLLEY

PASSENGER BROCKWAY EQUIPMENT TRANSPORTATION

Brockway Corporation

Cortland, New York

Originators of low center of gravity transportation equipment

TIMKEN

Timken Equipped

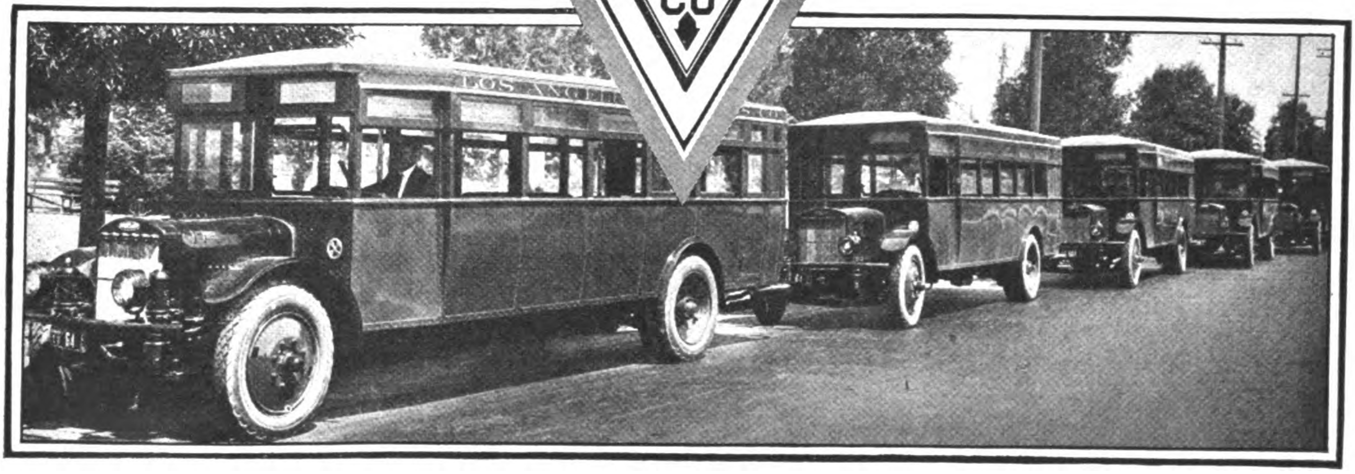
Timken is equipped by experience, by engineering ability and by manufacturing facilities to meet new developments in automotive transportation.

For twenty-five years Timken Axle designing has constantly anticipated and been ready for such developments.

It is not strange that the most forward-looking and progressive motor-bus designers in the field today are building Timken-equipped buses.

THE TIMKEN-DETROIT
AXLE COMPANY
Detroit, Michigan

AXLES



PANTASOTE
TRADE MARK
AGASOTE
TRADE MARK

Standard for
Electric Railways

THE PANTASOTE COMPANY, INC.
11 Broadway, New York
Peoples Gas Building, Chicago
Monadnock Building, San Francisco

GREATER COMFORT—GREATER SPEED—GREATER SAFETY—GREATER PROFITS

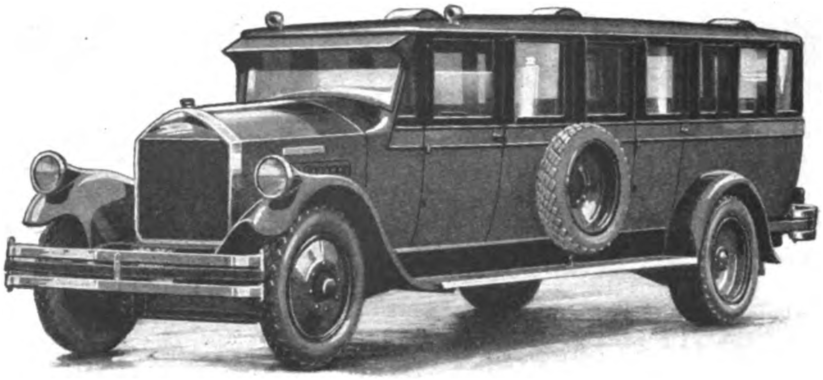
You Buy the Public's GOODWILL When You Buy Pierce-Arrow Busses

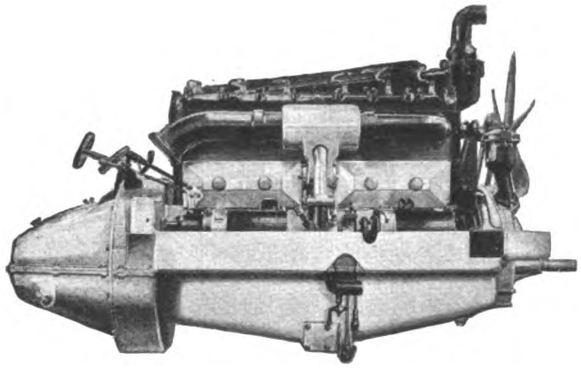
Standard Chassis

$4600

for 196-inch wheelbase, $4750 for 220-inch wheelbase, at Buffalo. Including starter, battery, generator, solid tires and electric lights. Pneumatic tires and disc wheels optional at extra cost.

Terms if desired





The Pierce-Arrow 6-Cylinder Bus Engine

The silent Dual-Valve, Dual-Ignition Pierce-Arrow Bus Engine develops over 100 horsepower at 2500 revolutions per minute.

It is so flexible that gear-shifting is reduced to a minimum. Speed of from 45 to 50 miles an hour can be maintained easily, if desired. In congested traffic, the engine will throttle down to an unusually slow pace in high gear and will accelerate powerfully.

The bus is propelled by a trouble-free inverted worm gear drive. The low-hung chassis has an unusually short turning radius.

◆ ◆ ◆

We will gladly arrange for a complete demonstration of the Pierce-Arrow Motor Bus at the factory.

Electric railways which have adopted the modern Pierce-Arrow Motor Bus for feeder or extension service immediately have the valuable goodwill of the riding public, for the name Pierce-Arrow represents to them the utmost in passenger transportation.

Those who have ridden in the Pierce-Arrow Bus say its performance is far more luxurious than the average limousine.

From an operating standpoint it is ideal because it can maintain an unusually fast headway, due to a remarkably high rate of acceleration and a rapid deceleration.

Learn more about this latest motor bus development. Get the facts about its unprecedented performance ability. The coupon will bring full information.

◆ ◆ ◆

The Pierce-Arrow Motor Bus chassis, produced in two lengths of wheelbase, will accommodate the de luxe, sightseeing or pay-enter types of wood or steel bodies, ranging from 18-passenger capacity upward.

THE PIERCE-ARROW MOTOR CAR COMPANY
Buffalo, N. Y.

Pierce-Arrow

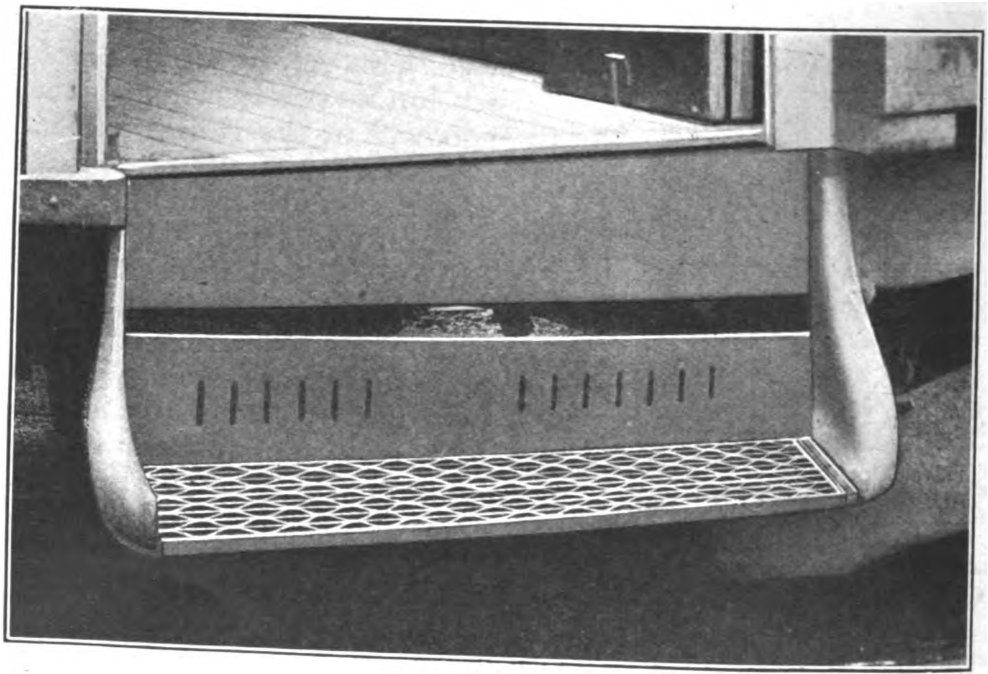
SEND THIS COUPON FOR FULL INFORMATION

The Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Gentlemen: Please send me literature and complete information about the Pierce-Arrow Dual-Valve Six-Cylinder Motor Bus and various types of bodies.

Name ....
Address ....
....

Why Use
Anything Other Than
IRVING SAFKAR STEP
TRADE MARK

ALL-STEEL AND PERMANENTLY NON-SLIPPING



It's Permanently Non-Slipping—an inherent quality in the step itself and not dependent upon mats or abrasive insets that wear out, work loose, and become a menace.

It's Clean—the dirt and dust and grit and slush fall through.

It's Light in Weight—yet has the strength of trussed steel construction.

It's Practically Indestructible—all-steel, solidly riveted, and will probably outlast any car.

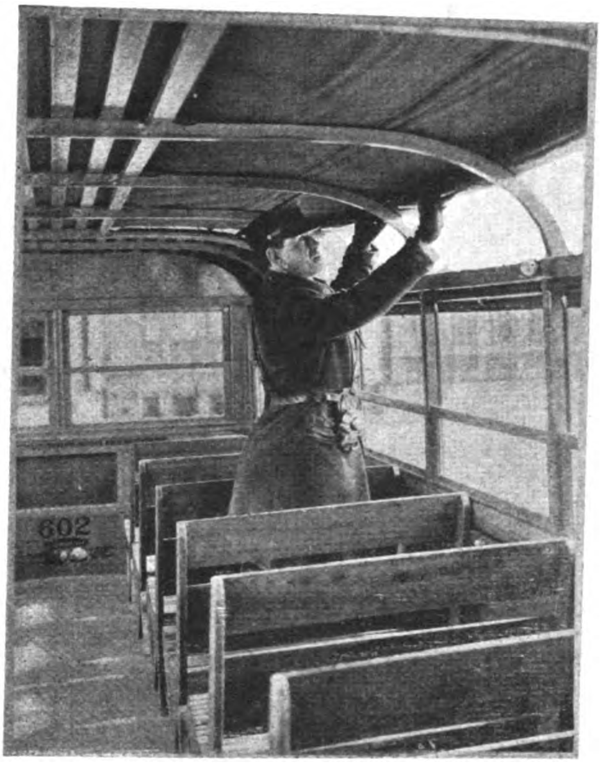
It's Adaptable—to any style or type of car.

It's First Cost Is Its Only Cost—you pay for it only once.

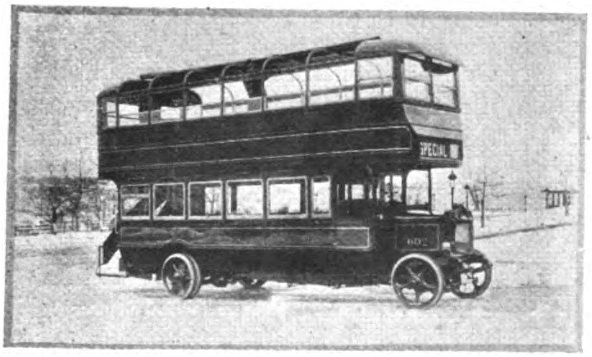
Write for Catalog 4A28

IRVING IRON WORKS CO.
LONG ISLAND CITY, N.Y. U.S.A.

The all-year double-deck bus—



The first practical all-weather top
Fifth Avenue Bus engineers have taken the lead in this as in every other phase of passenger bus development. Eight years designing, building and operating experience stands behind this equipment.



Just a few moments to make the change
A summer shower—a cool evening—maybe an unexpectedly warm Sunday in the Fall—either way the bus is readily adapted for maximum popular satisfaction.

Crowded with pleasure riders in summer
Observation and experience have proved the popularity of the open-air ride. All seats on this bus afford comfort, rain or shine.

—An open car in fair weather
—A closed car in bad weather

FIFTH AVENUE BUSES

the ideal automotive equipment for bus operation

Meets the demand for a high-capacity unit, adaptable to all seasons. This Type 2-L Fifth Avenue Bus seats 64 passengers. The adjustable, all-weather top, makes the entire seating capacity available all the time. Its overall height, unloaded, is fourteen feet. Fifth Avenue Buses appeal especially to railway operators. They have been an actual operating reality for years. Their reliable and economical service is a matter of record.

The figures are all down in black and white. Low maintenance costs and remarkable endurance records attract the operator who does not wish to experiment with new and untried automotive equipment.

As for prices—

We especially invite investigation by electric railway companies. Our quotations will stand any comparison.

NEW YORK TRANSPORTATION CO.
New York, N.Y.

The Case for

TEXACO

Direct Examination into Lubricating Costs on Street Railways

Q. What portion of total operating costs are represented by lubrication costs?

A. An average of 1/10 of 1 per cent.

Q. What part of total maintenance costs are lubrication costs?

A. About 2 per cent.

Q. So, then, lubricating costs are a very small portion of total maintenance costs?

A. Yes, but they have a profound bearing on maintenance and operating costs.

Q. That's admitted. Now tell me can lubricant consumption, or lubricating costs, be accurately predetermined a year in advance?

A. We believe not.

Q. But that is sometimes attempted, is it not?

A. Yes.

Q. What happens?

A. If more oil is paid for than used effectively, obviously there is a waste which ought to be eliminated.

On the other hand, maintenance will suffer if a rigid predetermined allowance compels the use of insufficient quantities of lubricants.

Both have been known to happen.

Q. What does TEXACO offer to Street Railways to insure lowest maintenance costs and lowest commensurate lubrication costs?

A. Co-operation of an unusually good staff of Lubrication Engineers, coupled with a wide range of high-grade lubricants suitable for every condition which may be encountered in the street railways.

TEXACO

THE TEXAS CO

[illegible] PLACE

[illegible]

PAGE TWO — THE CASE FOR TEXACO — CONTINUED FROM OPPOSITE PAGE

Q. What is the function of these Texaco Lubrication Engineers?

A. They investigate, advise, demonstrate and cooperate, as desired.

Q. How, then, are Texaco Lubricants for Street Railways sold?

A. By the gallon.

Q. How are the prices?

A. Right!

Q. Explain that please.

A. They are priced to yield The Texas Company a fair profit, because that is good business to all at interest. And then because of the follow-up of Texaco Engineers and the intrinsic merits of Texaco Lubricants themselves, roads using Texaco Lubricants find them profitable.

Q. How can you demonstrate that the use of Texaco Lubricants and Texaco Service are profitable to Street Railways?

A. In two ways.

Q. What are they?

A. One, the evidence of the thousands of miles of first-class street railway properties being lubricated by Texaco.

Two, a test or trial on any road or any part of a road which is looking for improved service.

Q. What do Texaco Lubricants cover?

A. A most complete line: lubricants for rolling stock, power plant, substation, track—burning oils, too.

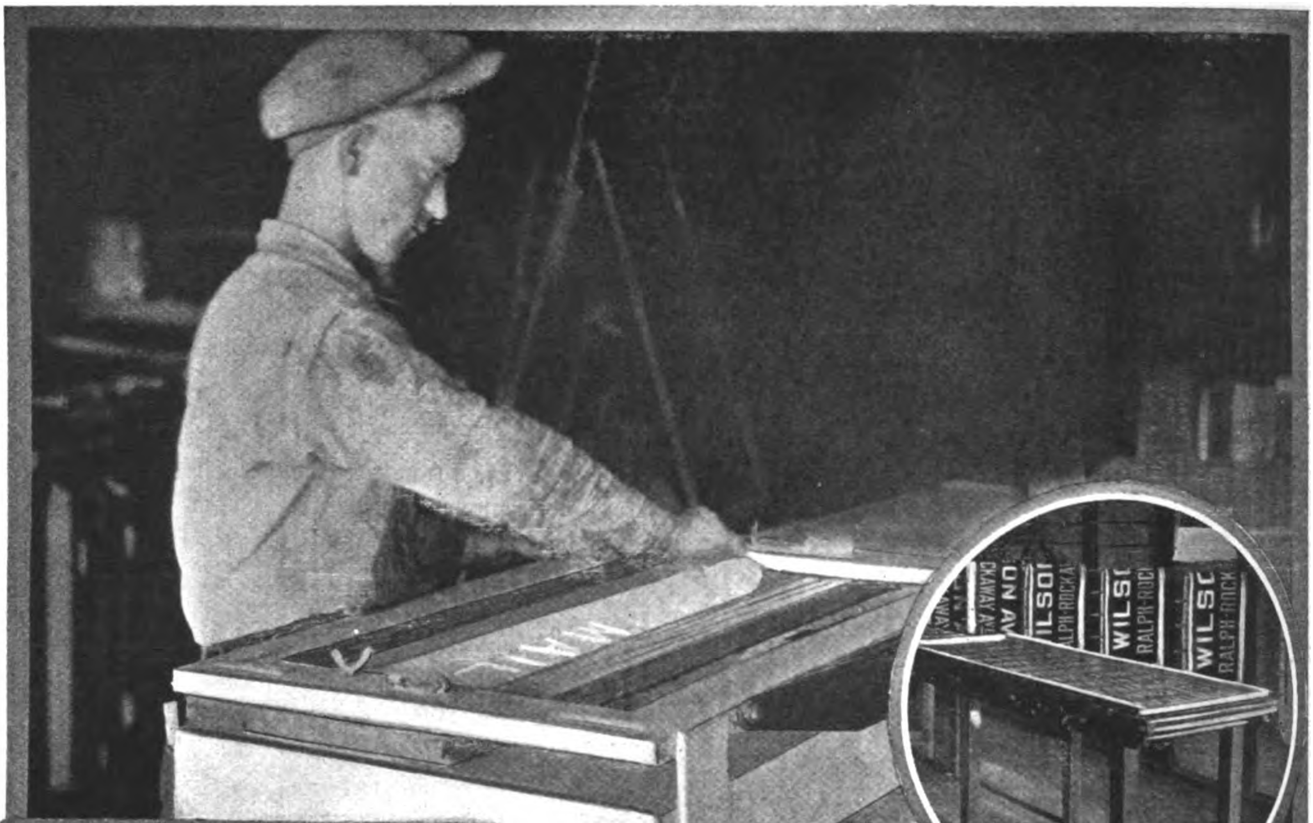
Gentlemen of the Street Railway Field: We rest our case.

The Verdict for any trial on any road has always been favorable to Texaco

When do you desire a trial on your road?

Remember, there is a Texaco Lubricant for every purpose.

THE TEXAS COMPANY
DEPT. R-J, 17 BATTERY PLACE, NEW YORK CITY
HOUSTON — CHICAGO — NEW YORK [illegible]
[illegible]


lettering along Routing Sign by the silk screen Process
WILSON
RALPH-ROCK

MADISON
CAROLINE
HIGHLANDTOWN
PAR
BROAD

Signs cost less when you make them by the

Silk Screen Process
and
BODMER
Stencil Silk

Bodmer Stencil Silk is a hand-woven imported fabric extremely strong and of perfectly uniform mesh. The Silk Screen Process is based upon forcing the paint thru the silk with a squeegee.

Many railway companies have found this method—faster, better and very economical, not only for making their own route and destination signs but also for display posters.

A Few Users:

Los Angeles Ry. Corp.—Pacific Electric R. R. Co.—Brooklyn-Manhattan Transit Corp.—Indianapolis Street Ry.—United Railways & Electric Co.

We will be glad to give you complete information on this new process and also help you install it in your shop.

KRESS & COMPANY
370 Gold St., Brooklyn

"INDIANAPOLIS"
Is Saving Electric Railways Millions of Dollars Annually

Don't spend a dollar on your track
(New or old)
Until you get "INDIANAPOLIS"
Prices for Comparison

"INDIANAPOLIS"
Economy Products
"They cost less"

Solid Manganese Crossings
also Frogs, Mates, and Tongue-Switches
(15 years of specializing has produced a product UNEXCELLED, and LOWEST in COST, quality considered)

Electric Welders
Thoroly Efficient
(Economical and never out of COMMISSION)

Welded Rail Joints
(A COMBINATION OF EVERY ESSENTIAL FACTOR in Rail Joining and Bonding)

Welding Steel Electrodes
Absolutely Dependable

Electric Welding Supplies
Hoods, Lenses, Carbons, Etc.

Better design
Higher quality
Longer service
Lower prices

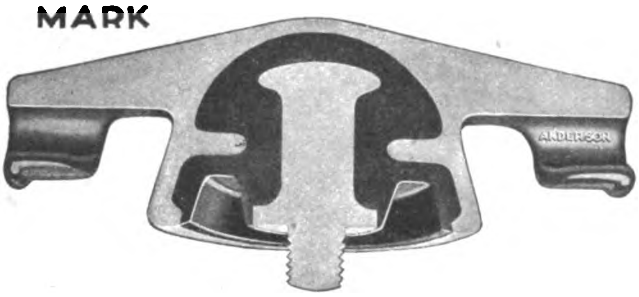
The Indianapolis Switch & Frog Co.
SPRINGFIELD, OHIO

Los Angeles San Francisco Kansas City Boston

TRADE

ANDERSON

MARK

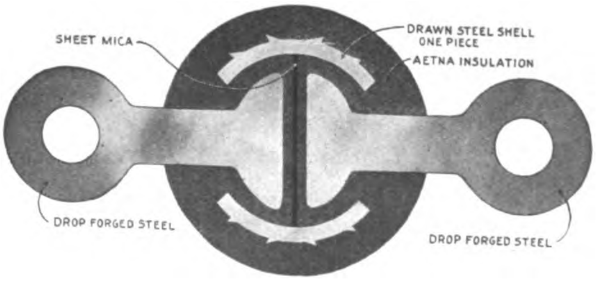


Round Top Straight Line Suspension

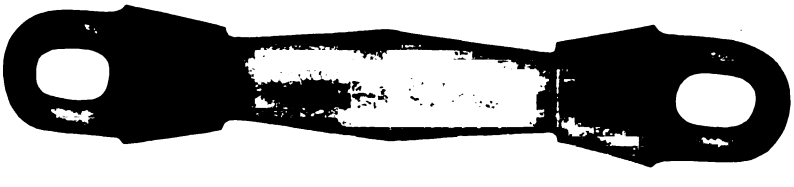
ANDERSON ROUND TOP STRAIGHT LINE SUSPENSIONS are especially strong, both electrically and mechanically. Line Foremen prefer them.

Anderson Crossovers

ANDERSON CROSSOVERS are scientifically made to insure long wear of both crossing and wires. The approach ears of bronze are pivoted to the main casting permitting them to rise slightly with the approach of the trolley wheel, thus taking the wear off the wire at the point subject to the greatest injury. This positively prevents crystallization and the subsequent breaking of the trolley wire at cross-over points.



ANDERSON STRAIN INSULATORS are of exceptionally high tensile strength. The terminals are drop forged galvanized steel. A one piece spherical steel shell is hydraulically pressed around the terminal heads inside, making it impossible for the terminals to be pulled out. The cross section here shows the internal construction. Between the studs inside heavy sheet mica is placed, and the whole is encased in Aetna Insulation.

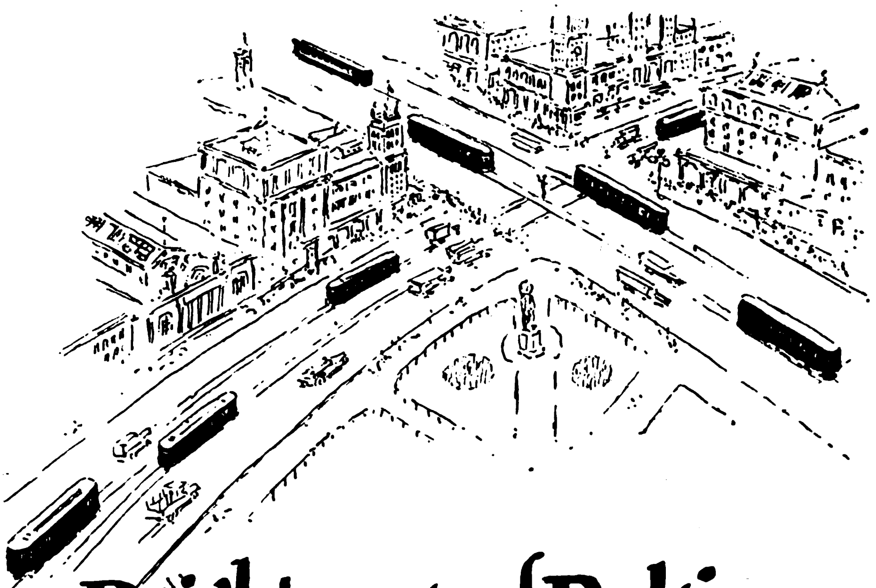


Partial List of Anderson Products for Electric Railways

- Insulated Bolts
- Feeder Plugs
- West End Suspensions
  - " " Straight Line
  - " " Single Curve
  - " " Double Curve
  - " " Bracket Arm
- Boston Suspensions
  - " Straight Line
  - " Single Curve
  - " Double Curve
  - " Bracket Arm
  - " Straight Line Twin
  - " Single Curve Twin
  - " Double Curve Twin
  - " Strain Twin
- Round Top Straight Line Suspensions
  - Single Curve
  - Double Curve
  - Bracket Arm
- Cap and Cone
  - " " Straight Line
  - " " Single Curve
  - " " Double Curve
  - " " Barn
  - " " Bracket Arm
  - " " Twin Straight Line
  - " " Twin Single Curve
  - " " Twin Double Curve
  - Types, A, B, C, D, E, F, G, H, I, J, K
- Yokes
  - Straight Line
  - Single Curve
  - Double Curve
- Insulators
  - Globe Strain
  - Elephant Globe Strain
  - Giant Strain
  - Wood Strain
  - Porcelain
  - Split Spool
  - Feeder Wire
  - Section Beam
  - Double Section Beam
- Double Take-Up Turnbuckles
- Turnbuckles
- Crossings
  - Any degree
  - Insulated
  - Uninsulated
  - Adjustable
  - Removable Ears
- Frogs
  - Any Degree
- 2-4-5 Pull Off Rings
  - Pivot Type
  - Removable Ears
  - Draw Bridge
  - Wearing Plates
- Splicing Sleeves
- Tubular, Wedge
- Splicing Ears
- Cable Splicers
- Ears
- Double Strain
- Half Strain
- Feeder
- Clamp
- Clamp Feeder
- Curve Clamp
- Double Strain Clamp
- Half Strain Clamp
- Solder Ears
- Feeder Solder Ears
- Double Strain Solder Ears
- Straight Line Clip Ears
- Double Strain Clip Ears
- Feeder Clip Ears
- Curve Clip
- Double Center Straight Line
- Mechanical Ears
- Strain Plates
- Overhead Conductor
  - Bar Construction
- Terminal Clamps
- Shackles
- Bell Suspensions
- Come-along Clamps
- Soldering Irons
- Trolley Wire Stretchers
- Cap and Cone Tongs
- Section Switches
- Disconnecting Line Switches
- Time Switches
- Testing Clamps
- Lindall Brush Holders
- Harps Wheels Sleet Cutters
- Quick Break Switches All Kinds

ANDERSON WOOD STRAIN INSULATORS—All materials used in the manufacture of our Wood Strain Insulators are of the highest quality obtainable. The wood sticks are selected second growth stock, split to approximate size before turning to shape in order to utilize the full strength of the grain of the wood. The pins are thoroughly treated by impregnation, which process excludes moisture and also enhances the life of the wood. Average breaking strain 1 in. diameter 7,000 lbs. Average breaking strain 1¼ in. diameter 9,000 lbs.

Albert & J. M. Anderson Mfg. Co.
Established 1877
289-305 A St., Boston, Mass.
Branches—New York, 135 Broadway. Philadelphia, Broad and Chestnut Sts.
Chicago, 105 So. Dearborn St. London, 12 Moor Lane E. C. 2.



SHERWIN WILLIAMS
PRODUCTS
RAILWAY FINISHES

S-W Products for railway use

- Old Dutch Enamel
- Truck Enamel
- Color Varnishes
- Roof Paints
- Insulating Varnishes
- Insulating Compounds
- "Eg-Shel Mill White" for Shops
- "Metalastic" Metal Protective Paints
- "Kromik Primer" the Inhibitive Primer

Bright spots of Baltimore
—2000 bright red cars—

on the job day in and day out

Rain, shine, snow, blizzard—blistering sun or biting cold. In all sorts of weather, day in and day out, the United Railways & Electric Company's distinctive red cars are on the job serving Baltimore people.

The exposure a street car gets is the severest sort of test for the finish. Yet, finishing no longer presents a problem in Baltimore.

**SHERWIN-WILLIAMS
Old Dutch Railway Enamel
Royal Durbar Red**

has taken care of this. A permanent, non-fading red, long in oil, it withstands wear and weather and looks well for the longest possible time.

Old Dutch Railway Enamel is only one of Sherwin-Williams Finishing materials for electric railway companies.

This Baltimore example is only one selected from among the many railway companies using Sherwin-Williams Paints and Varnishes.

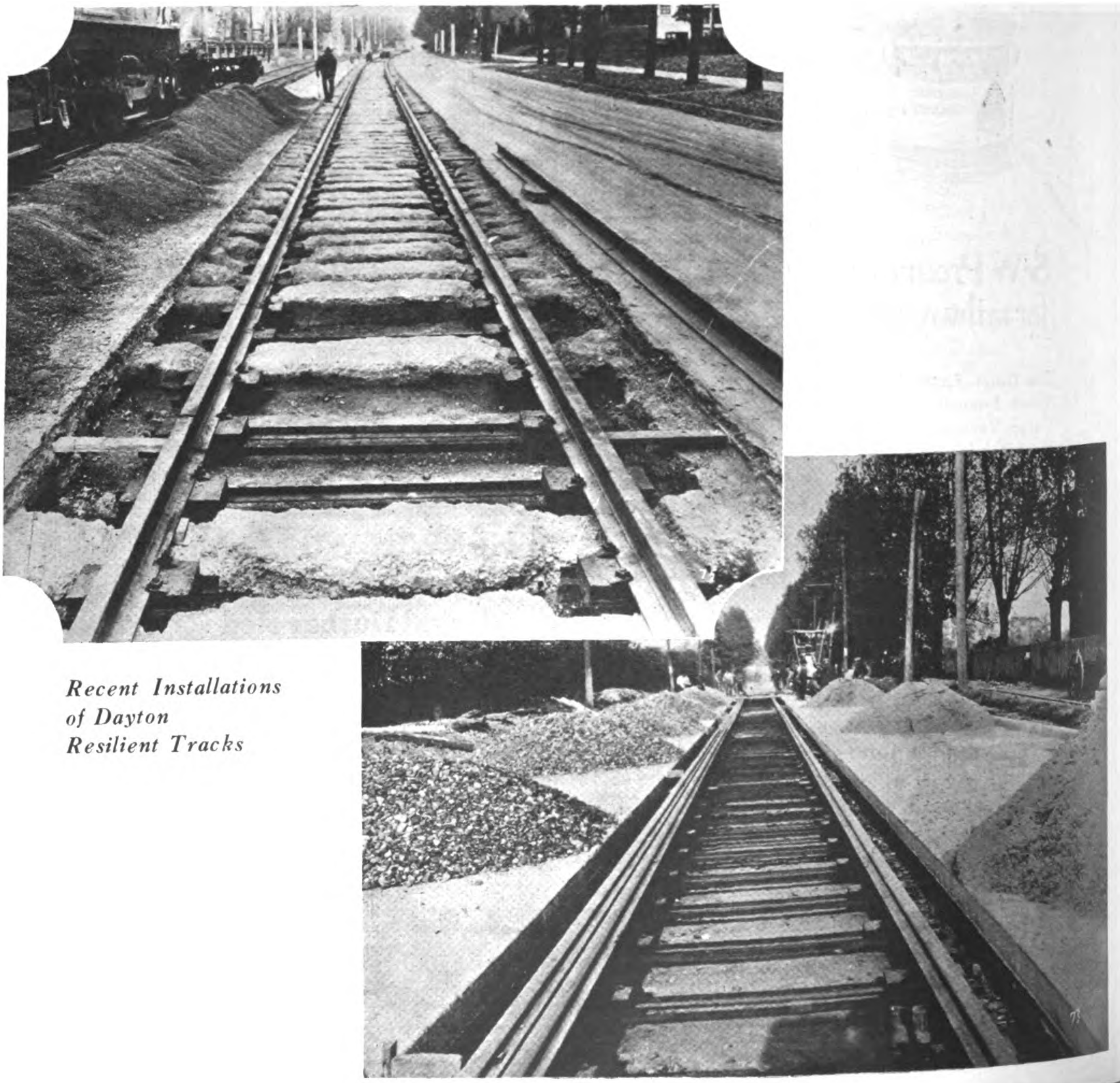
Address:

**General Railway Sales Department
THE SHERWIN-WILLIAMS CO.
Administrative Offices and Factory,
601 Canal Road, Cleveland, O.**
Branches in all principal cities

**SHERWIN-WILLIAMS
PAINTS AND VARNISHES**

DYESTUFFS, COLORS, PIGMENTS, CHEMICALS, DISINFECTANTS, WOOD PRESERVATIVES

SHOCK



Recent Installations of Dayton Resilient Tracks

DAYTON

The Chief Cause of Track Deterioration

SHOCK is more destructive to the roadbed than frost or time. It is the shock that shatters the concrete track foundation.

Eliminate shock and the problem of track maintenance is practically solved. Street railway properties are accomplishing this by installing the Dayton Resilient Track. Resiliency is now admittedly the one indispensable requisite for permanently efficient tracks. The committee on way matters of the A.E.R.A. went on record last year as to its importance.

Resiliency is the fundamental principle of the Dayton Resilient Tie. Dayton Ties cushion the shock—and the concrete does not break. Dayton Joint Ties and Joint Boosters keep the rail joints level with the rest of the track. By using the Joint Booster you can add seven to ten years of life to your old track.

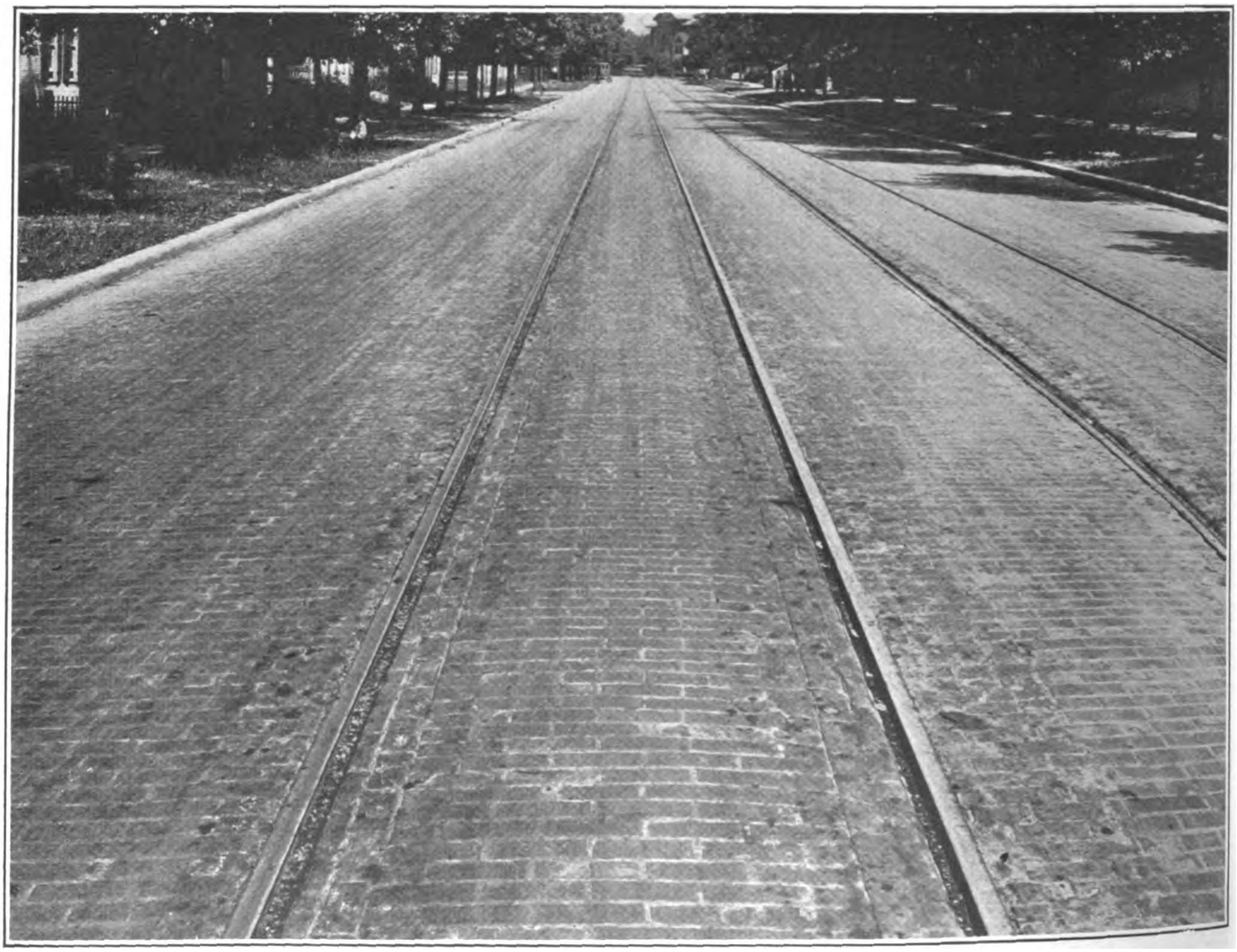
Ask us for facts and figures about Dayton Resilient Track.

On the two following pages we show how the Dayton Resilient Tie is as great a benefit to the rolling stock as to the track.

Resilient TIE

The Dayton Mechanical Tie Co.
707 Commercial Building
DAYTON, OHIO

SHOCK



A Dayton Tie Installation—nine years old

Car maintenance cost is at a minimum
here because **resiliency** cushions shocks.

DAYTON

Keeps the Repair Shops Busy

A BLOW is as great a shock to the hammer as to the object struck. In street railway operation, the track is the anvil—the rolling stock the hammer. Since shock works both ways, it destroys the rolling stock no less than the track.

And there you have the reason for much of the repair to rolling stock. Little, perhaps, does the repair shop foreman realize that the track is to blame for so much of the work he has to do. In other words, the condition of the track largely determines the amount of rolling stock repair. Sagging joints and uneven track soon knock rolling stock to pieces. Rigid track is no less harmful.

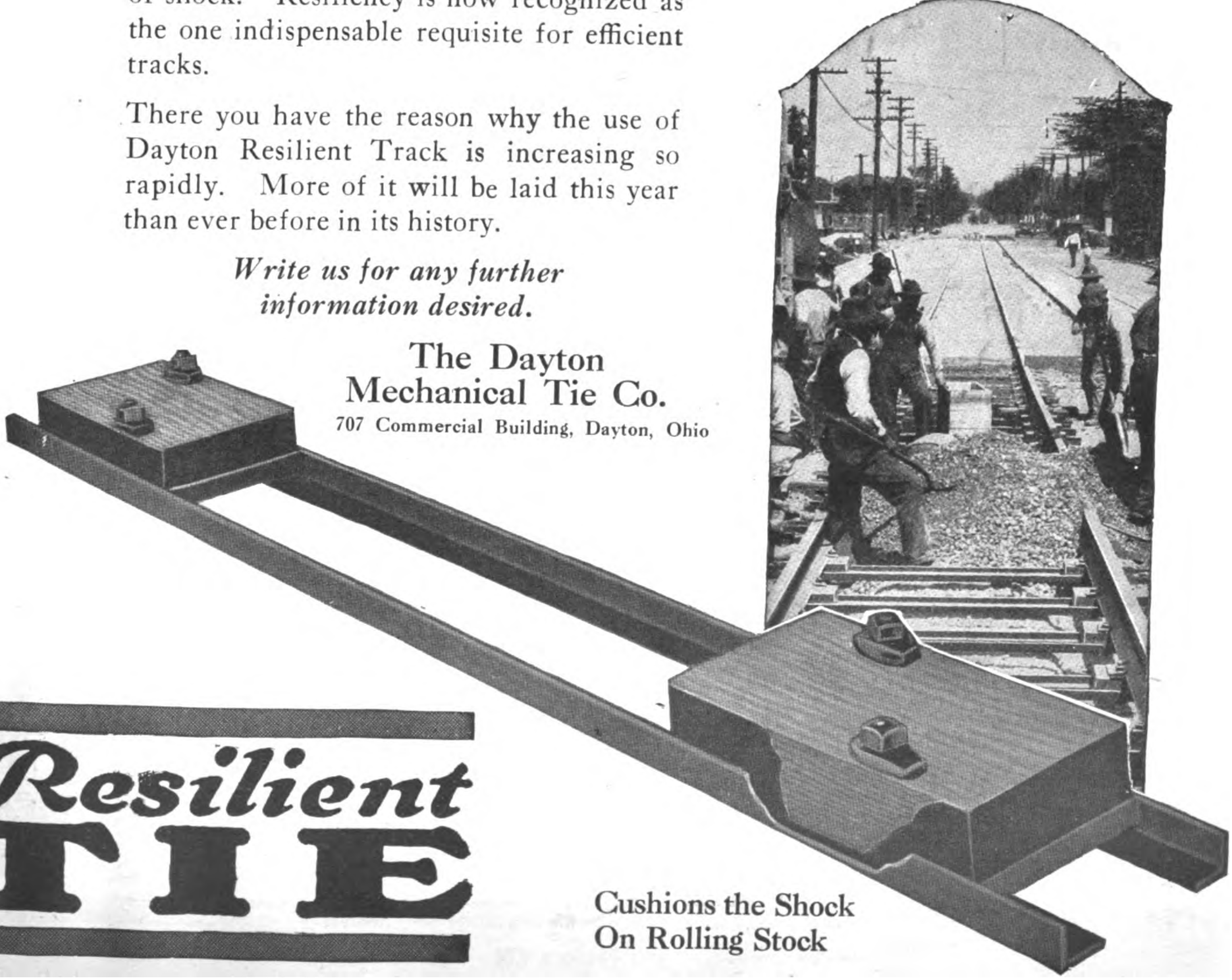
Only by cushioning the shock of traffic can you eliminate this costly evil.

Resilient track construction is what is required to overcome the destructive effects of shock. Resiliency is now recognized as the one indispensable requisite for efficient tracks.

There you have the reason why the use of Dayton Resilient Track is increasing so rapidly. More of it will be laid this year than ever before in its history.

Write us for any further information desired.

The Dayton
Mechanical Tie Co.
707 Commercial Building, Dayton, Ohio



Resilient
TIE

Cushions the Shock
On Rolling Stock

Phono-Electric

A new monument to service in the "Monumental City"

Original Phono-Electric in Baltimore still good after 13 years!

Two massive stone memorials, each commemorating an ideal of service, and among the earliest of their kind to be erected in America, give to Baltimore the name of "The Monumental City."

Washington Monument in Vernon Place and Battle Monument in Monument Square carry a deathless message to posterity.

But there's another monument in Baltimore today that has a more practical significance to progress;—the stretch of Phono-Electric Trolley Wire on Linden Avenue, which was installed in 1911, and which is still feeding juice to a busy car line after 13 years.

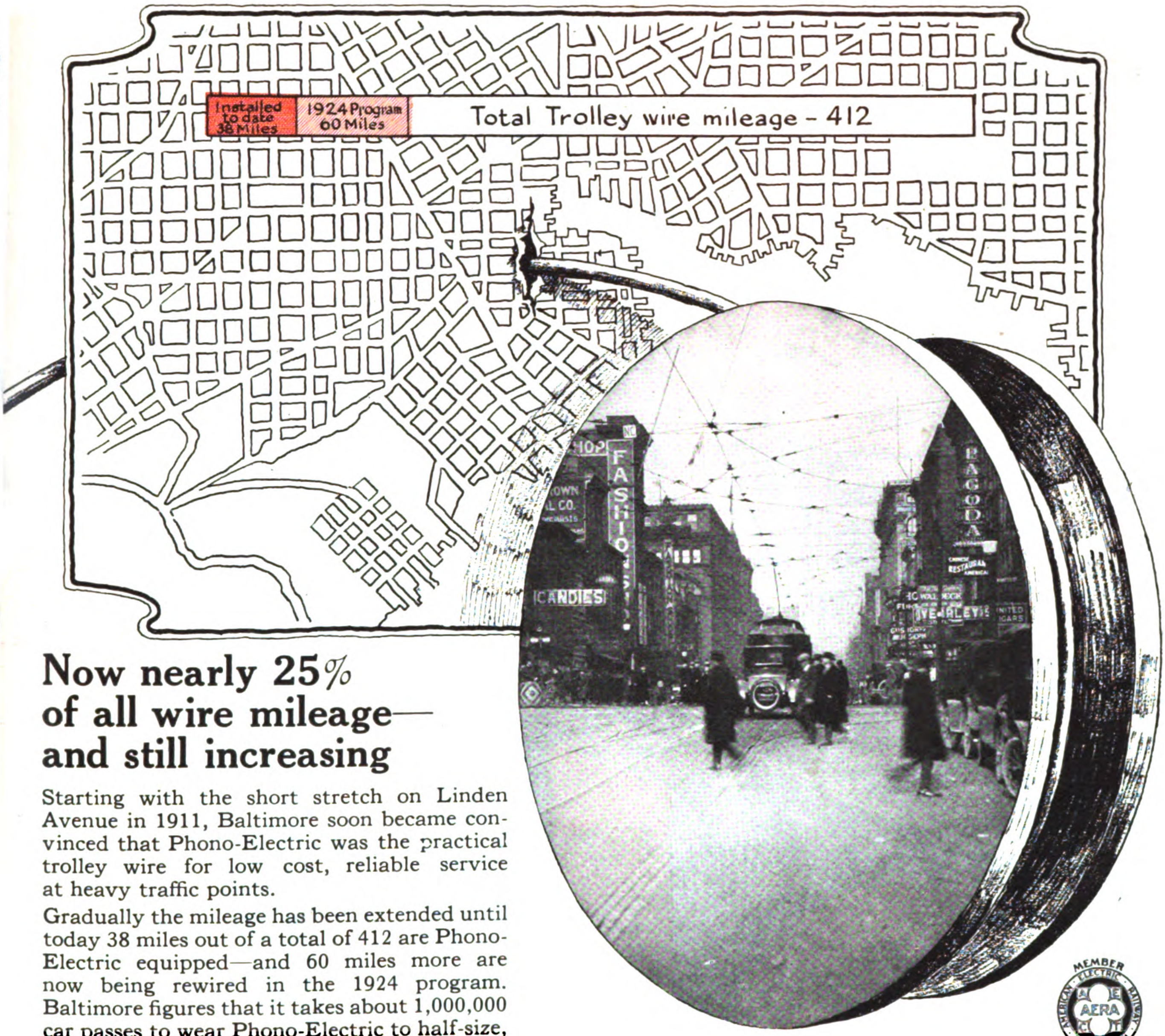
Such monuments to service as this, not only in Baltimore but in many another progressive American City, are convincing electric railway men of the logical economy of a trolley wire that outlasts hard drawn copper two to three times.

"Bridgeport"
BRASS CO.
TRADE MARK
Phono-Electric

Members of the Copper and Brass Research Association.

Electric Furnace Products

in Baltimore



Now nearly 25% of all wire mileage—and still increasing

Starting with the short stretch on Linden Avenue in 1911, Baltimore soon became convinced that Phono-Electric was the practical trolley wire for low cost, reliable service at heavy traffic points.

Gradually the mileage has been extended until today 38 miles out of a total of 412 are Phono-Electric equipped—and 60 miles more are now being rewired in the 1924 program. Baltimore figures that it takes about 1,000,000 car passes to wear Phono-Electric to half-size, whereas ordinary copper trolley wire is so reduced, after comparatively short service, that any advantages it may have on the score of conductivity are lost.

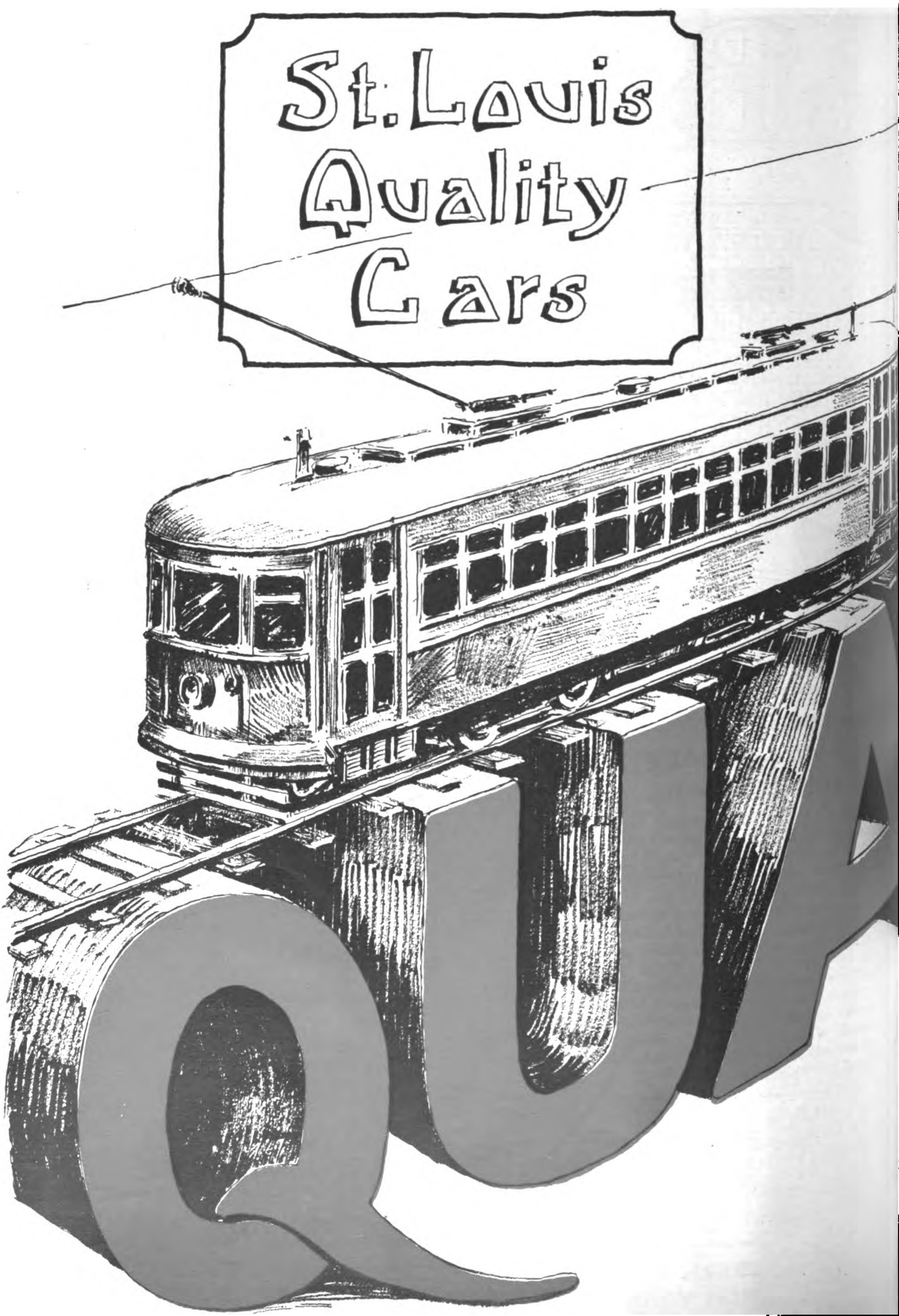
We'll be glad to co-operate in supplying full details on request.

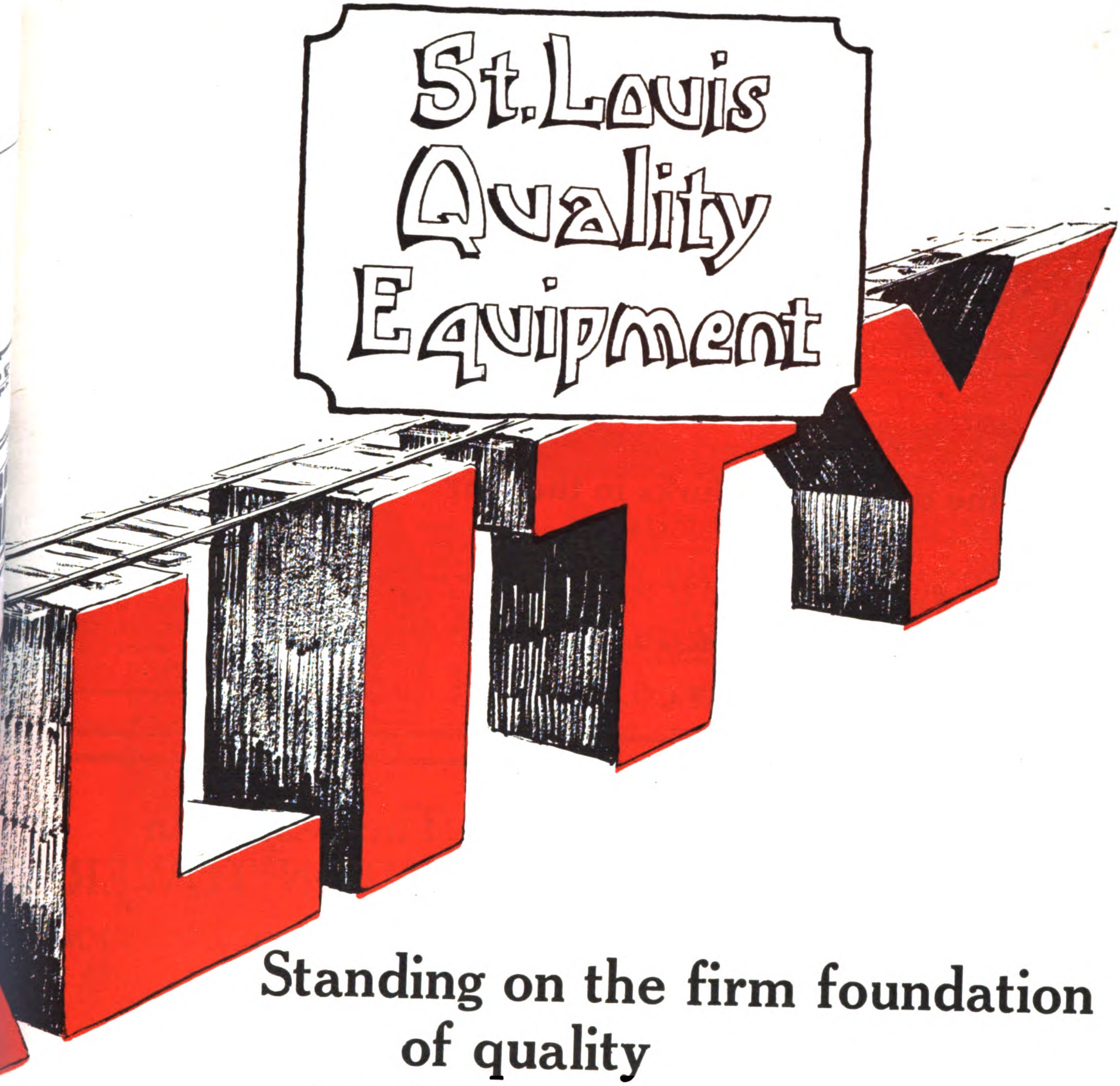
MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA 1924

Bridgeport Brass Company

BRIDGEPORT - CONNECTICUT

NEW YORK PHILADELPHIA CHICAGO DETROIT


St. Louis
Quality
Cars
QUA



Standing on the firm foundation of quality

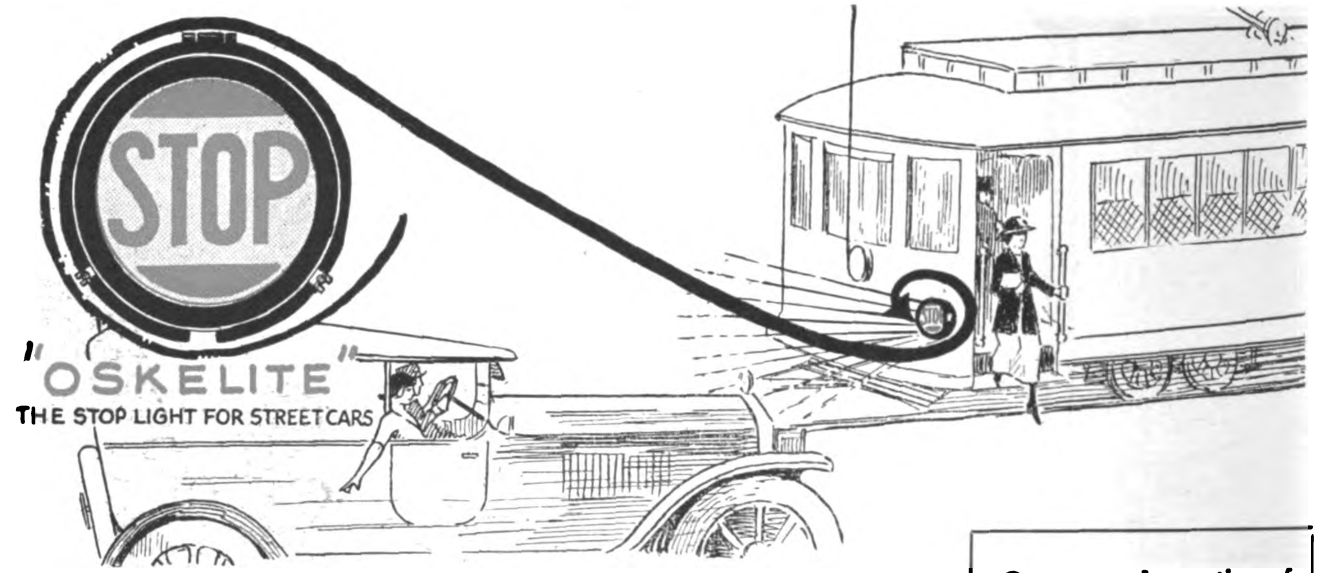
"Quality" shows on the maintenance record!

Thirty-five years of this consistent "Quality" policy has definitely established the reputation of St. Louis Cars and Equipment, for low maintenance costs.

Ask for our quotations

- **Birney Safety Cars**
- **"Universal" Double-Truck**
- **One-Man Two-Man Cars**
- **Standard City Cars**
- **Interurban Cars**
- **Trackless Trollicars**
- **Self-Propelled Rail Cars**
- **Trucks**
- **Forgings and Castings**
- **Platform Brakes**
- **Car Seats**
- **Rattan for Repairs**
- **Metal Trimmings**
- **Steel Bus Bodies**

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"


STOP
"OSKELITE"
THE STOP LIGHT FOR STREETCARS

Stop the danger that lurks in the rear

"Oskelite" is as important on the rear of your street cars as the warning gong is in the front. With the growth of traffic, particularly because of automobiles, signalling devices of all kinds have come into popular usage. People are trained to look for and obey warnings. Your street cars need this Stop Light System to safeguard your customers, to protect your cars from damage and to speed up your own schedules. Can be seen at a distance of 1000 feet.

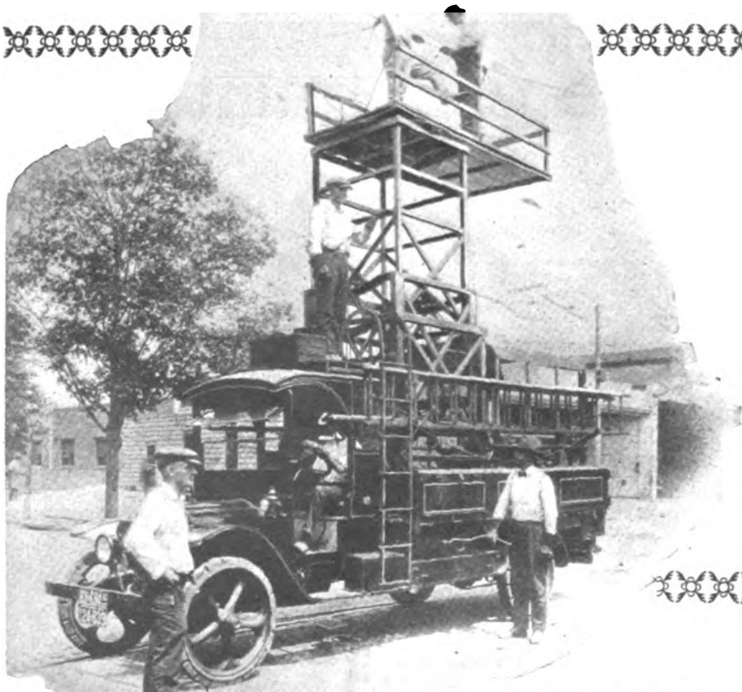
Can be installed on any type of car. Economical, no maintenance required. Write or ask for full particulars.

THE OSKEL EQUIPMENT CO. 940 McCormick Bldg., CHICAGO, ILL.

Operates by action of brakes—the only correct principle for absolute dependability.

Continues to signal as long as brakes are applied or car door is open. Easily installed. Dependable in action.

The 3-Section TRENTON TOWER



In Washington, D. C.

A 3-section Trenton Tower used by the Washington Railways & Electric Co.

It's a truly "finished job"

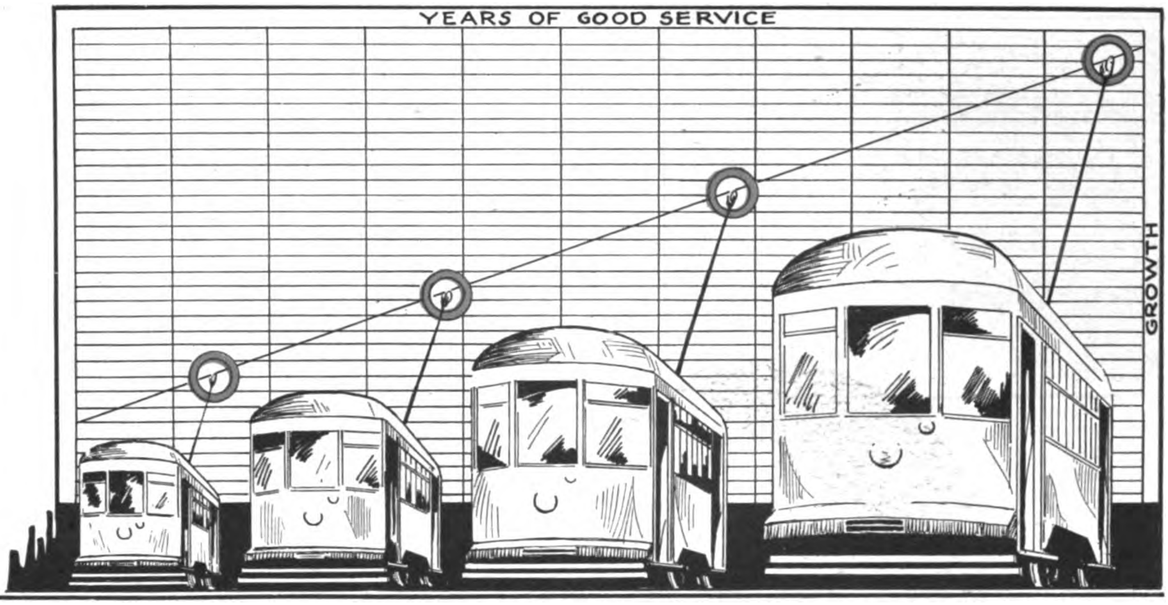
Whether for ordinary line maintenance work or for the occasional serious emergency, it's cheapest in the long run to use a properly designed, well-made, substantial piece of equipment. Makeshift towers are at best a poor substitute.

This 3-section Trenton Tower is more convenient than the older styles. It possesses a durability which will keep it in service years after the makeshifts have been scrapped.

The top section is reinforced by the intermediate one, and due to this construction the range of maximum and minimum heights is greatly increased.

Ask for further details.

J. R. McCARDELL CO.
TRENTON, N. J., U. S. A.



A Remarkable Growth in the usage of More-Jones Trolley Wheels, Bearings and Babbitt Metal

The growth of demand is the indication of recognized superiority. The secret of better manufacturing lies in the thought and ability back of the product. In the continual grind of daily duty the service rendered is the test of dependability and of the integrity of materials used. The value of equipment in the service has a direct bearing on the continual growth of purchases.

We are experiencing an unusual demand for More-Jones quality products. Re-orders mean satisfaction. New customers mean the realization of merit. Because of greater value and their service possibilities these products have come to be known as standard.

MORE-JONES BRASS & METAL CO.
ST. LOUIS, MISSOURI

ST. LOUIS
V-K 2

"TIGER BRONZE" is strong, tough, durable and of the lowest specific gravity. Is most widely used.

ARMATURE BABBITT quality guarantees a slow and even rate of wear and correct bearing alignment.

MORE-JONES B&M CO'S
ST. LOUIS MO.
ARMATURE

MORE-JONES QUALITY PRODUCTS

The Connecticut Company is one of the many transportation and industrial concerns realizing large daily returns on their investment in Paasche air painting equipment. There are over 50,000 Paasche Air Devices in daily use.

Saving $9,000 Yearly

One of the many users of Paasche Painting Equipment says:

"Our biggest saving is in labor, because one man with an air brush can do 4 times as much as a man with a hand brush. As this means that our 2 Paasche air brush operators are doing the work of 8 men, our labor saving amounts to $8,985.60 a year."

"The even distribution of the paint effects fully a 10 per cent saving in quantity of material. The money saving depends on the kind of paint used. The colored paints are the most expensive, but most of our work is battleship gray. However, we figure that we save $1.00 a day, or $300 a year, in paint.

YOU, TOO, can probably make remarkable savings and improve your finishes to a great extent by the use of Paasche equipment. Write our Engineering Division regarding your requirements. Our twenty years' experience is at your disposal. No obligations.

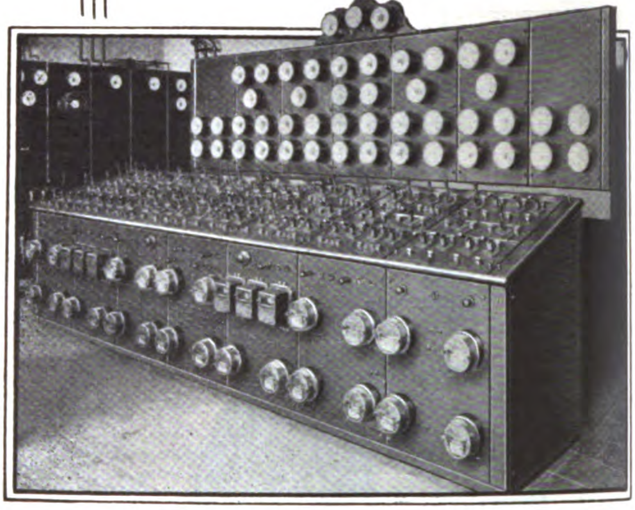
Paasche Air Brush Co.,

Mfrs. of Air Brushes, Portable Painting Machinery, Air Compressors, Finishing Room Equipment, Pneumatic Rubbing Machines, Artists' and Decorators' Supplies.

1922 Diversey Parkway, Chicago, Ill.
New York Office, Dept. L, 54 Dey St.

Paasche
Portable Painting Equipment

Ebony Asbestos Wood



Ebony Asbestos Wood Installation, Dept. of Public Service, Bureau of Power & Light, Los Angeles, Cal.

The highest quality insulating base

A FINE looking job—that's your first comment on an Ebony Asbestos Wood installation.

But remember that Ebony offers more than appearance. Laboratory tests show that it has better characteristics, both electrically and mechanically, than any other commercial insulating base. This means higher dielectric strength and resistance to surface leakage plus the ability to stand severe physical strains even when heavily drilled.

In addition Ebony Asbestos Wood is easier to install because of its workability. You will find it easier to cut, drill, and machine, and at the same time lighter and easier to erect.

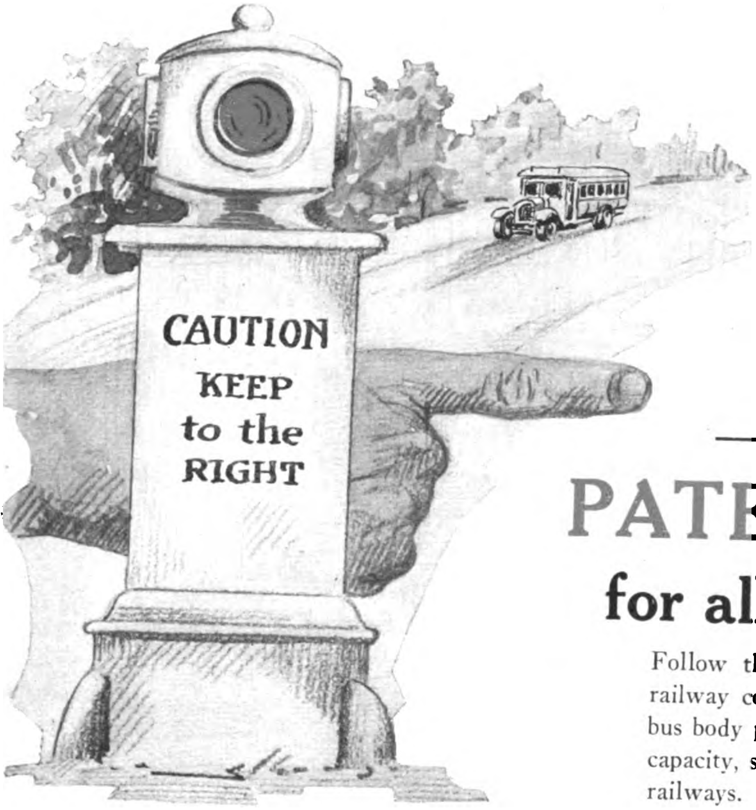
These factors combine to place Ebony Asbestos Wood in a class by itself as a material for switchboards, panel boards, and special mountings of almost every type, large or small.

It is the one insulating base material that makes no compromise with any of the essential requirements of its job.

JOHNS-MANVILLE Inc., 294 Madison Ave. at 41st St., N. Y. C.
Branches in 61 Large Cities
For Can.: Canadian Johns-Manville Co., Ltd., Toronto

Through — Electrical Materials for Utilities Jobber Contractor and Dealer

JOHNS-MANVILLE



—and specify PATERSON BODIES for all your motor buses

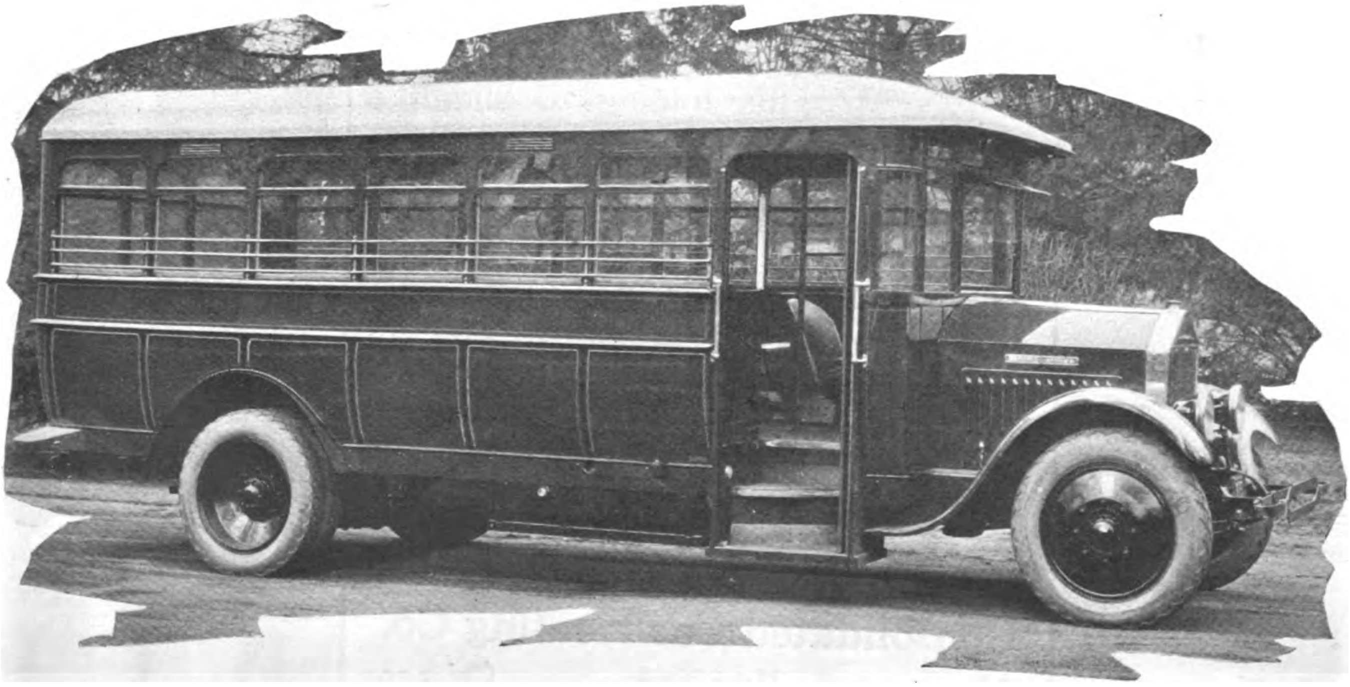
Follow the example of other well-known electric railway companies and avoid experimenting on the bus body problem. We have been furnishing large-capacity, standardized bodies to some of the leading railways. We know what the requirements are and how to meet them.

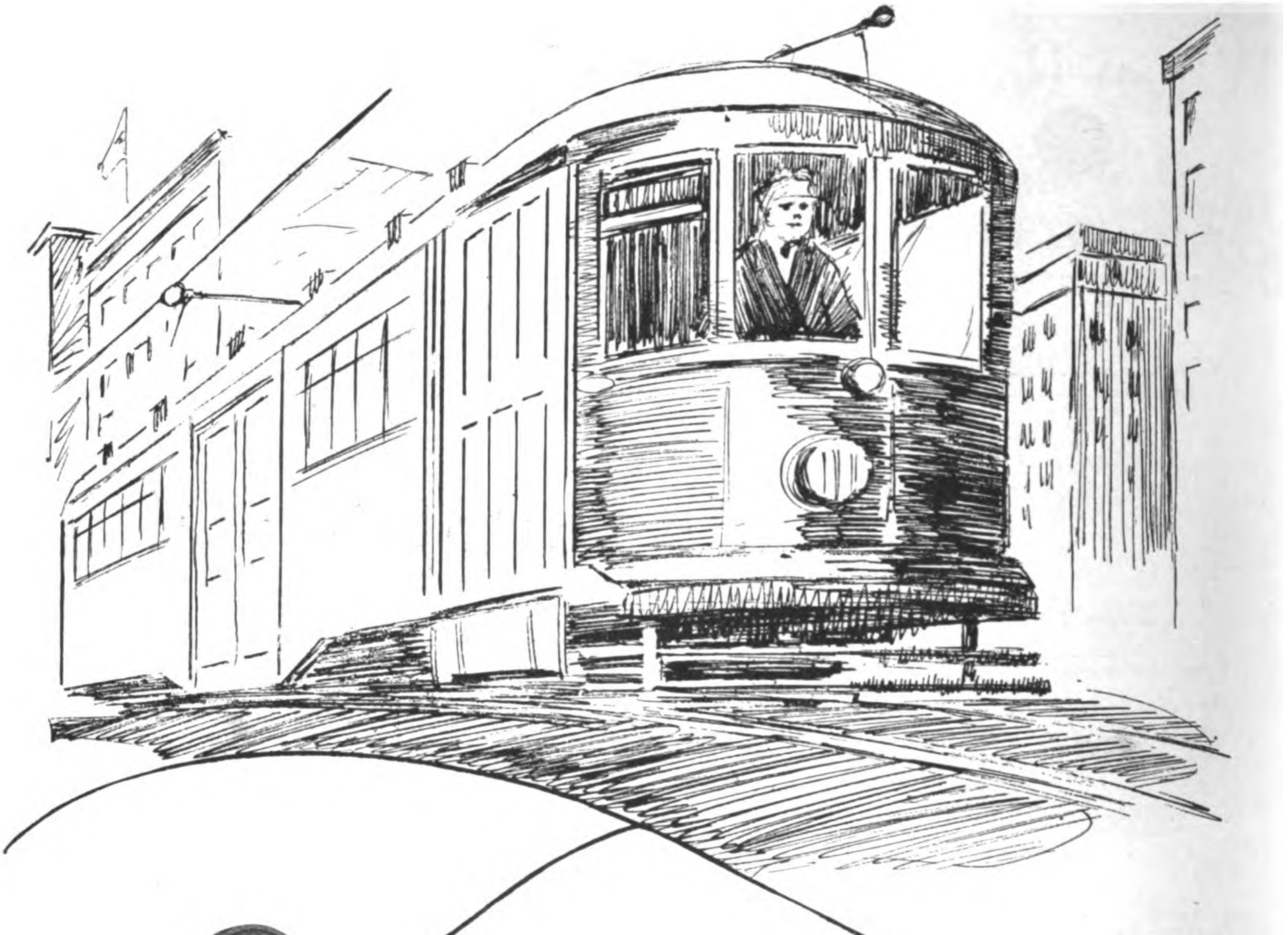
Paterson Bus Bodies are *really standardized!* The railway equipment man knows and appreciates what this means. *It simplifies the maintenance problem.*

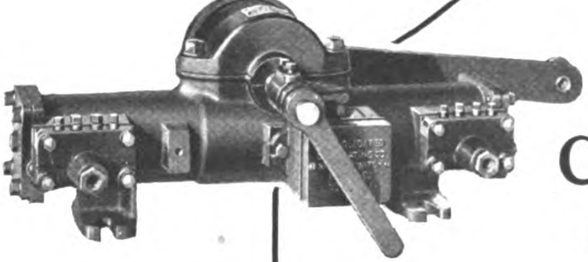
Write for photographs, specifications and quotations

Paterson Vehicle Company
General Office: 257 Market Street
Bus Body Factory:
27th Street and 19th Avenue, Paterson, N. J.

—— because the maintenance cost is less!







Consolidated

Door Engines

and complete pneumatic door operating equipment, including connecting levers—switches—push button control boxes, etc., for folding or sliding doors, either hand valve or push button control with special safety features are used on some of the largest electric railways in this country.

Their use under the most exacting traffic conditions attests their reliability.

Consolidated Car Heating Co.

Albany New York Chicago

When Railway Motors Need Repair

PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Your Best Insurance Against Future Trouble Lies in M. I. Co. Products

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

M-I-C
COMPOUND
MICA INSULATOR COMPANY

Repairing and rebuilding your Railway Motors with Mica Insulator Company Products ensures a remarkable degree of safety, reliability and endurance.

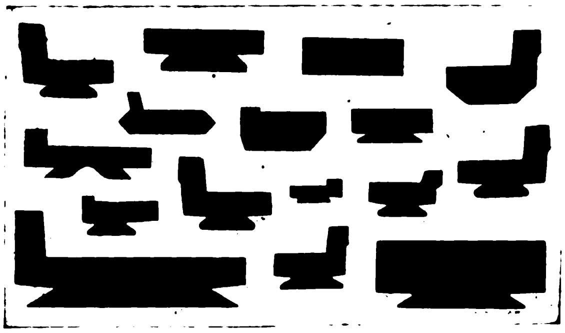
The Service Record of Mica Insulation is based on 30 years of use throughout the Electrical Industry.

The "ready to ship" stock is varied and complete, and meets practically all requirements.

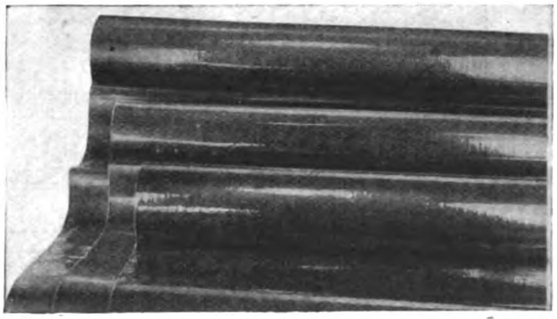
We show here a few of our 57 standard products—special insulations and forms can be promptly supplied to meet your specifications.

We particularly solicit your business for the repair and rebuilding of high duty equipment.

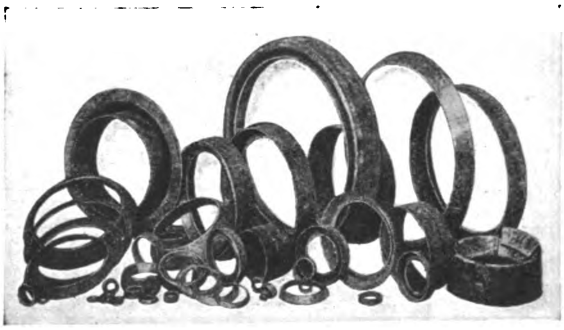
LIGHT COLORED
INSULATING VARNISH
PERFECT
LINOLSAC
INSULATOR
MICA INSULATOR COMPANY



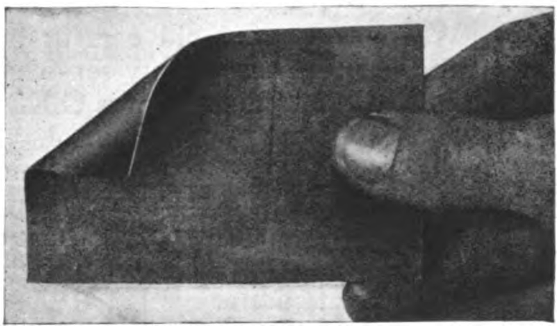
Micanite Commutator Segments



Empire Oiled Cloth



Micanite Commutator Rings



Armatite for Slots—2 Insulations in 1

Send for data and test pieces. Send to our nearest office for data and quotations on your insulation requirements, and for test samples and full information. Our Engineering Department is at your disposal for suggestions and recommendations.

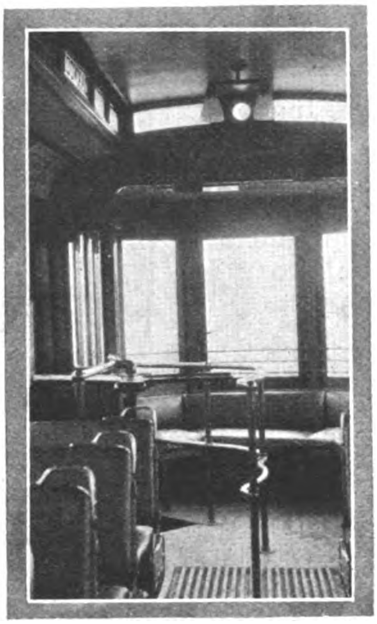
MICA INSULATOR CO.

Main Office: 68 Church Street, New York.
Works: Schenectady, New York.

Chicago Office: 542 South Dearborn Street.
Canadian Office: Victoriaville.

2036-F

SYRACUSE
CAR
TURNSTILE



For Single End, Double End and Peter Witt Cars

Makes practical

the double-truck one-man safety car of every type

because it makes possible orderly passenger interchange, using both ends of the car. The old idea of combined entrance and exit facilities at the front end is impracticable for the larger cars and heavy traffic.

The Syracuse Car Turnstile at the rear end or center door provides the solution. It's suitable for every type of one-man car. Increases safety, reduces duration of stops, and is easy to install. Other roads are using it successfully.

Write for details.

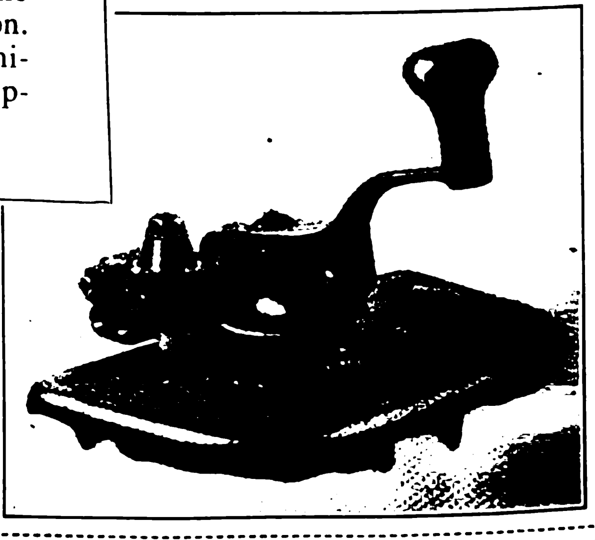
THE TURNSTILE CAR CORPORATION
383 West Fayette St., Syracuse, N. Y.
W. M. Lawyer, Sales Manager

Adapted to existing brake equipment

When converting old cars or buying new ones for one-man safety service, the standard air-brake equipment is O.K., in connection with E. Z. Car Control. Our Pilot Valve controls both application of the brakes and gives selective door operation. An installation is simple, safe and economical. And there is no complicated equipment to maintain.

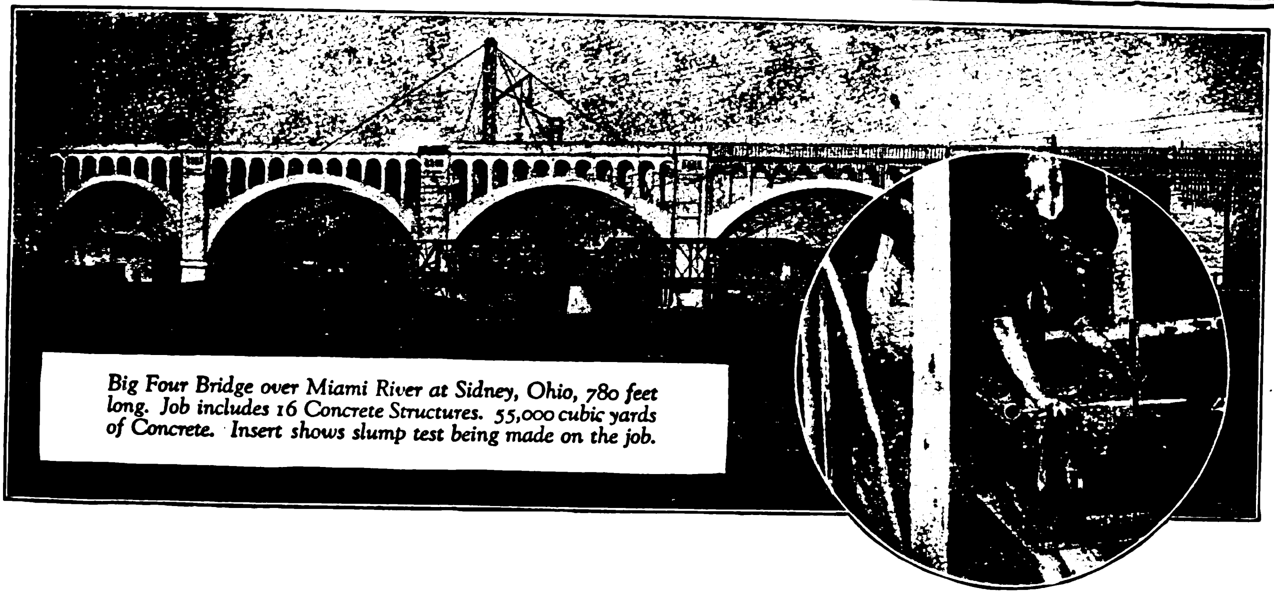
E. Z. CAR CONTROL

For double-end cars.



Ask for Further Information

THE TURNSTILE CAR CORPORATION
383 West Fayette St., Syracuse, N. Y.
W. M. Lawyer, Sales Manager



Big Four Bridge over Miami River at Sidney, Ohio, 780 feet long. Job includes 16 Concrete Structures. 55,000 cubic yards of Concrete. Insert shows slump test being made on the job.

Right on the Job!

Big Four Railway Engineers have added another important page to the history of modern Concrete construction.

On the job, shown above, they first determined the strength of Concrete required for various parts of the work.

Then field methods, based on laboratory principles, were used to secure the strengths determined.

The methods applied to control quality included grading of aggregates by means of sieve analysis, determination of proportions by means of fineness modulus, the slump test for consistency, and testing of specimens at regular intervals.

The results of the field tests proved that predetermined strengths were being consistently obtained.

This is only one of many examples of uniformly high quality Concrete assured through practical tests and methods of control — *right on the job.*

* * *

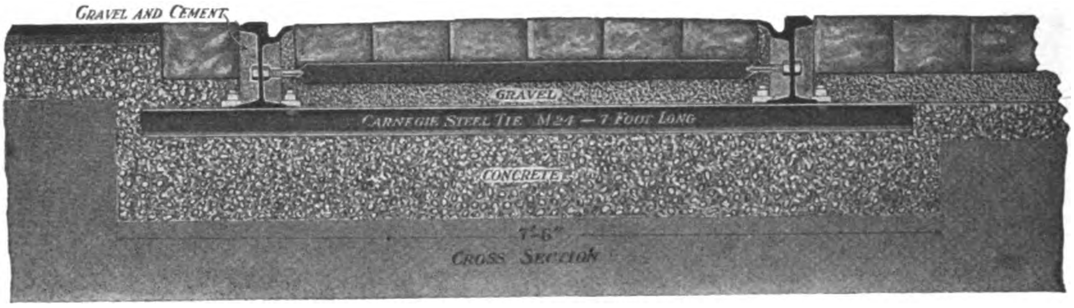
The work at Sidney was done by the Walsh Construction Co. under the supervision of C. A. Paquette, Chief Engineer, J. B. Hunley, Bridge Engineer, and E. A. Humphries, Resident Engineer, Big Four Railway.

We will gladly send you reprint of an article from Engineering News-Record, October 11, 1923, fully describing this job, and also any definite information you may want regarding the use of field methods of control in your own work. Just write to the nearest office, listed below. There is no obligation.

PORTLAND CEMENT ASSOCIATION

A National Organization to Improve and Extend the Uses of Concrete

Atlanta
Birmingham
Boston
Chicago
Dallas
Denver
Des Moines
Detroit
Helena
Indianapolis
Jacksonville
Kansas City
Los Angeles
Memphis
Milwaukee
Minneapolis
New Orleans
New York
Parkersburg
Philadelphia
Pittsburgh
Portland, Oreg.
Salt Lake City
San Francisco
Seattle
St. Louis
Vancouver, B. C.
Washington, D. C.


GRAVEL AND CEMENT
GRAVEL
CARNEGIE STEEL TIE M24 — 7 FOOT LONG
CONCRETE
7'-6"
CROSS SECTION

The Perfect Track

Safety—Economy—Endurance

These three are requisites of true efficiency and can be secured by the use of

Carnegie Steel Cross Ties

As the use of Steel Cross Ties is an essential item toward the attainment of The Perfect Track, so then should they be included as an essential item in your track maintenance program.

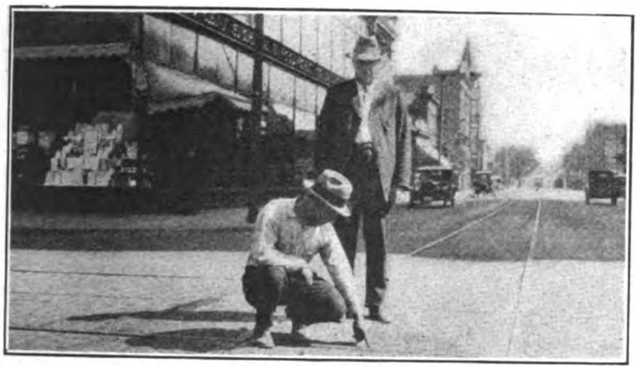
Listed below are other products manufactured especially for railway use. They are made to the same high standard of quality that has won for Carnegie Steel Company the reputation it today enjoys.

Wrought Steel Wheels
Standard Forged and Heat Treated Axles
Rails and Splice Bars

Carnegie Steel Company

GENERAL OFFICES - CARNEGIE BUILDING 434 FIFTH AVENUE - PITTSBURGH, PA.

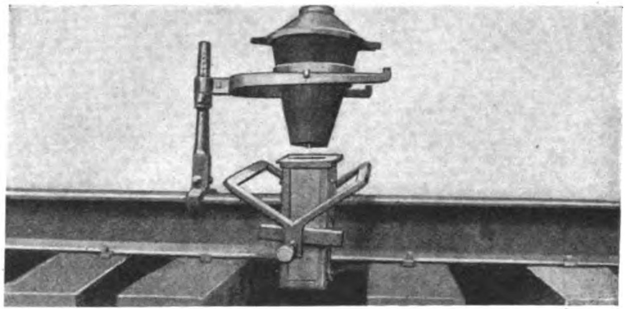
1608



Milwaukee, Wis.

Indianapolis, Ind.

Some of the Thousands of Feralite Joints Welded in 1923



Ready for Welding

Uniform—Strong—Durable—Economical

RAIL ends are actually butted together and fused into one solid, homogeneous piece by the FERALITE Process of aluminothermic welding. No foreign or extraneous matter is inserted between them, therefore, absolute uniformity is obtained. Furthermore, there is little excess metal to be ground after welding.

The FERALITE mixture is prepared in our own plant under careful and expert supervision. Because of the use of nothing but highest grade pure materials, accurately portioned as to chemical contents and suitably mixed, FERALITE steel is free from impurities, blow holes, and hard spots, when poured into properly-prepared molds.

FERALITE method of rail welding is more efficient and economical than any other process.

Do you want aluminothermic rail welds at lowest cost?
Then write today for full details and quotations
on the Feralite process.

ALUMINO-THERMIC
FERALITE
TRADE MARK
WELDING MIXTURE

ALUMINO-THERMIC CORP.
ROSELLE PARK, N. J.

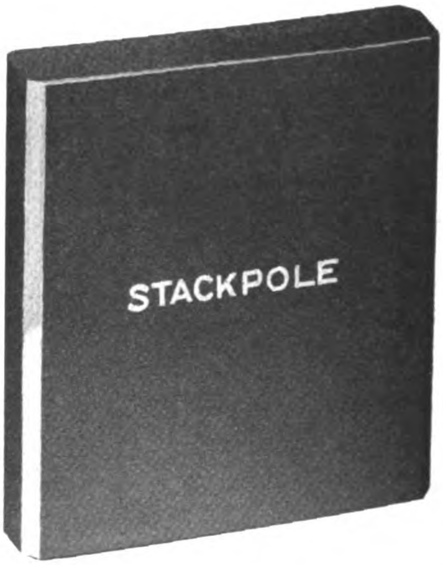
Write Stackpole on your next carbon brush order

MAKE certain that your commutators operate continually at their maximum of performance and operating economy,—by using STACKPOLE BRUSHES.

The clean, shining appearance of your commutator when equipped with the STACKPOLE Products means longer brush and commutator life with increased power. STACKPOLE BRUSHES are self-lubricating—they minimize sparking, insure perfect commutation and are practically noiseless.

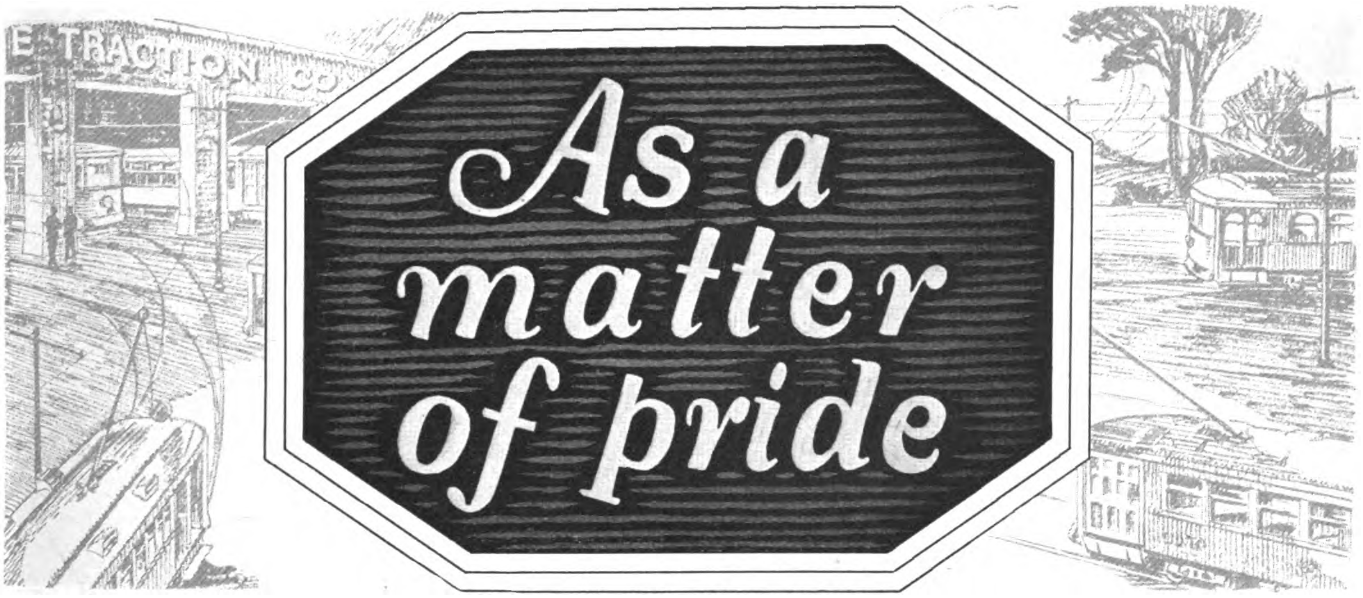
Stackpole's Catalogue No. 8 tells an interesting story on Carbon Brushes. Write for your copy.

THE STACKPOLE CARBON CO.
St. Marys, Penna.
Branch Offices in the Principal Cities



Stackpole carbon brushes

the Better Brushes with the Longer Life


As a matter of pride
E TRACTION CO

This advertisement is addressed to the managers, superintendents, and foremen of electric railways who take a personal pride in keeping the equipment under their care at the highest state of efficiency at the lowest maintenance cost.

These men realize the part proper lubrication plays in establishing the records they are making. From sad experience they know that unless they secure proper lubrication their repair shop will be the busiest place on the property, the pay-roll sheet for the maintenance gangs will look like yesterday's call sheet and the bills for replacement parts will be tremendous.

But with proper lubrication of equipment all these profit-eating troubles vanish. Pull-ins are out of the ordinary. Labor costs for repairs, and for oiling and renewing waste, are at a minimum. Cars out of service for emergency repairs are the exception, not the rule.

Men who have had such experiences appreciate the lubricants made by the Standard Oil Company (Indiana), and the lubricating services rendered by its engineering staff. These men are enthusiastic in their adherence to Standard Lubricants.

Records showing reductions in lubricating costs from 20% to 50% are numerous. One typical case records a run of 45,000 miles without a change of waste; another shows where 1600 cars were operated more than two months without a bearing failure.

The good records these products have made furnish ample reason why you should use them.

The men who have made them will be glad to tell you how Standard Oils and Greases and the services of Standard Oil Lubricating Engineers made them possible. We will be glad to furnish you their names on request.

STANDARD OIL COMPANY
(INDIANA)
910 S. Michigan Avenue **CHICAGO, ILLINOIS**

ILLINOIS
Chicago
Decatur
Joliet
Peoria
Quincy

INDIANA
Evansville
Indianapolis
South Bend
KANSAS
Wichita

IOWA
Davenport
Des Moines
Mason City
Sioux City

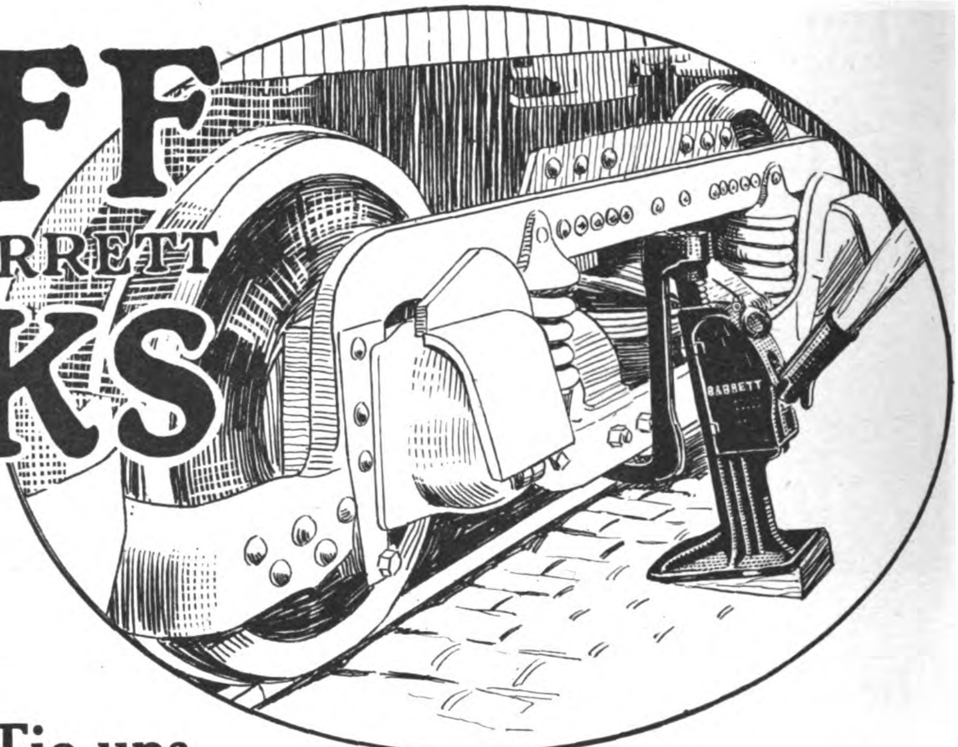
S. DAKOTA
Huron
MICHIGAN
Detroit
Grand Rapids
Saginaw

N. DAKOTA
Fargo
Minot
WISCONSIN
La Crosse
Milwaukee

MINNESOTA
Duluth
Mankato
Minneapolis

MISSOURI
Kansas City
St. Joseph
St. Louis

DUFF
GENUINE BARRETT
JACKS



Relieving
Derailments, Tie-ups and accidents quickly

On the thousands of cars where a Duff No. 239 Jack is carried as standard equipment, it has proven invaluable in emergencies. This sturdy and handy jack quickly puts a derailed car back on the track, and equally quickly gets a stalled truck out of the way, be it ever so heavy. By means of forged steel swivel claw, loads can be *lifted* as well as *pushed* aside. The claw may be lowered to within 3 in. of the ground, and be raised 10½ in. This gives it an unusually wide range of usefulness.

For Track Work—the Duff No. 1 Trip Jack continues to be the tool favored by the greatest number of steam and electric railways. Its latest and most improved design embodies several new and convenient features. Write for special bulletin.

For Car Shops—the genuine Barrett Ratchet Jacks and Duff Ball Bearing Screw Jacks, in capacities from 10 to 50 tons, are the World's standard.

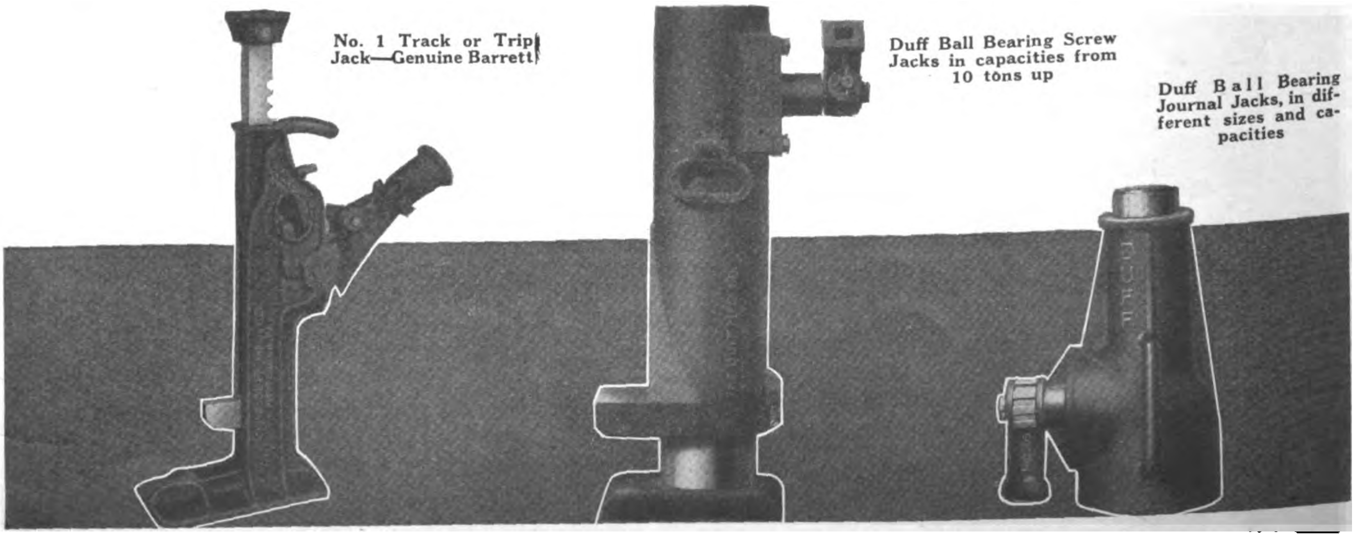
Duff Catalog No. 106—latest edition—describes a complete line of jacks, meeting every requirement of electric railway companies.

Barrett No. 2, a general utility jack of 10 tons capacity. Dependable, quick-raising, convenient; the World's leading 10-ton jack.

THE DUFF MANUFACTURING CO., Pittsburgh, Pa.

Established 1883

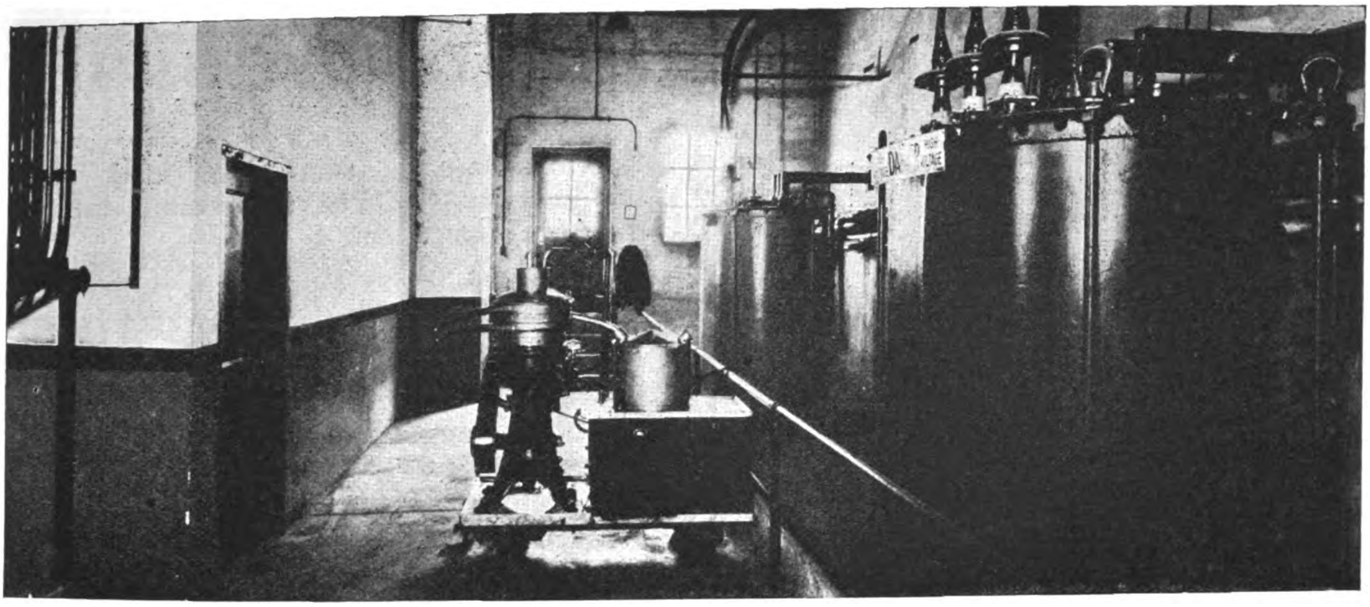
New York **Chicago** **Atlanta** **St. Louis** **Houston** **San Francisco**



No. 1 Track or Trip Jack—Genuine Barrett

Duff Ball Bearing Screw Jacks in capacities from 10 tons up

Duff Ball Bearing Journal Jacks, in different sizes and capacities



De Laval Transformer Oil Purifier in the West Tulsa Station of the Oklahoma Power Company.

De Laval Transformer Oil Purifier used in Oklahoma's largest central station

The West Tulsa Station of the Oklahoma Power Company with its output of 20,000 kw., which is shortly to be increased to 30,000 kw., is Oklahoma's largest central station. Naturally in a plant of this type one expects to find the most modern and most efficient equipment, and the De Laval Transformer Oil Purifier shown in the above illustration tells the story so far as a means for dehydrating transformer oil is concerned.

This machine does its work so well and so quickly that it is used not alone for transformer oil in service at the various stations of this company, but is also used for cleaning up other miscellaneous oils, and is from time to time loaned to other utility companies in the vicinity. Surely this leaves little doubt as to the speed and efficiency with which the De Laval Transformer Oil Purifier does its work.

The secret of the efficiency of the De Laval Transformer Oil Purifier is in the construction of its bowl—the revolving member in which dehydration takes place. This is so constructed as to divide the incoming oil into thin sheets or layers so that centrifugal force is applied to the oil while it is in the condition which enables water and solid impurities to be most easily and thoroughly removed. Thus, more thorough dehydration and greater capacity can be obtained with a moderate degree of centrifugal force than can otherwise be obtained through the application of the greatest centrifugal force which it is practicable to generate in a commercial way.

De Laval Transformer Oil Purifiers are furnished as stationary or portable units, the latter being equipped with all auxiliaries needed to handle the oil. From industrial plants which need to operate a machine perhaps once a month, to large power systems having five or six of them in almost daily service, users are finding great satisfaction and economy in the use of these De Laval machines.

The De Laval Separator Company
New York, 165 Broadway **Chicago, 29 East Madison Street**
DE LAVAL PACIFIC COMPANY
San Francisco

Sooner or later you will use a
De Laval

Please send Bulletin containing further information regarding the De Laval Oil Purifier as checked below:

☐ Purification of Diesel lubricating and fuel oil.
☐ Purification of turbine lubricating oil.
☐ Dehydration of transformer oil.

Name ....

Company ....

Address ....E. R. J.

Lightest Weight Stationary Steel Seat

Bring down the

Comfortable cars,—comfortable seats, attractive interiors—these have become essential to successful operation.

Still, costs must be kept within rather strict limits these days. And that's where Hale & Kilburn Seats will help.

For they're essentially comfortable, built to take the "cramp" out of car riding. But at the same time they're practical,—just simple,

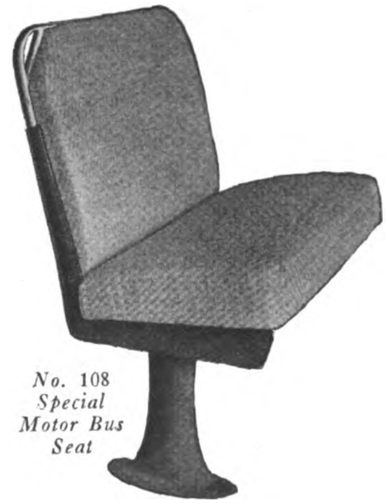
HALE AND CAR

Suitable Styles for City Cars,

Hale-Kilburn Company

Sales Offices:
Hale-Kilburn Company,
30 Church St., New York
Hale-Kilburn Company,
1530-33 McCormick Building,
Chicago, Ill.

E. A. Thornwell,
1513 Candler Building,
Atlanta, Ga.
National Safety Car & Equip. Co.
Theresa and Clark Ave.,
St. Louis, Mo.



No. 108 Special Motor Bus Seat

Standard Rattan Walkover Steel Seat

"comfort" cost

sturdy designs that look good and feel good after years of the toughest service.

There are types of Hale & Kilburn Seats to meet exactly your service requirements, whether for "safety" or heavy interurban. **The patented "space saving" feature** permits of maximum capacity without crowding.

Remember they're lightest, simplest, strongest, neatest.

KILBURN SEATS

Interurbans, Motor Buses

Philadelphia, Pa.

Frank F. Bodler,
903 Monadnock Building,
San Francisco, Cal.

Chris. Eccles,
320 South San Pedro Street,
Los Angeles, Cal.

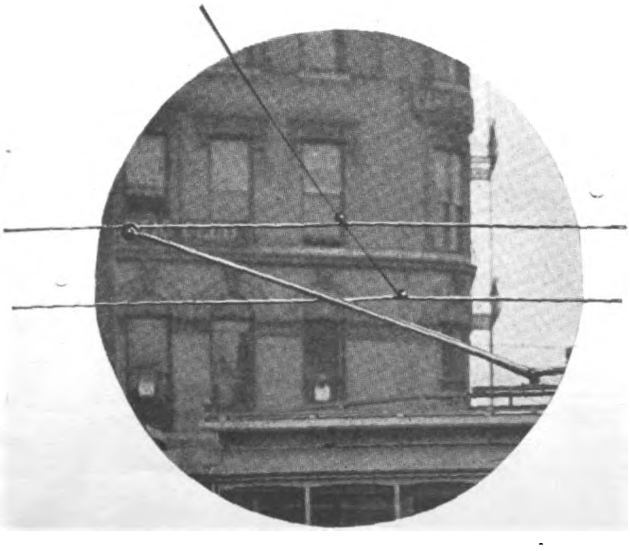
Harry M. Euler Company,
46 Front Street, Portland, Oregon

T. C. Coleman & Son,
Starks Building, Louisville, Ky.

Lightest Weight Walkover Steel Seat

Standard Interurban Steel Seat

No. 108 De Luxe Motor Bus Seat



Trolley Wheels
Bushings
Bearings
Section Insulators
Section Switches
Rail Bonds

Flood City

Trolley Line Specialties

PREPARE for your maintenance needs by getting in contact with Flood City Trolley Line specialties.

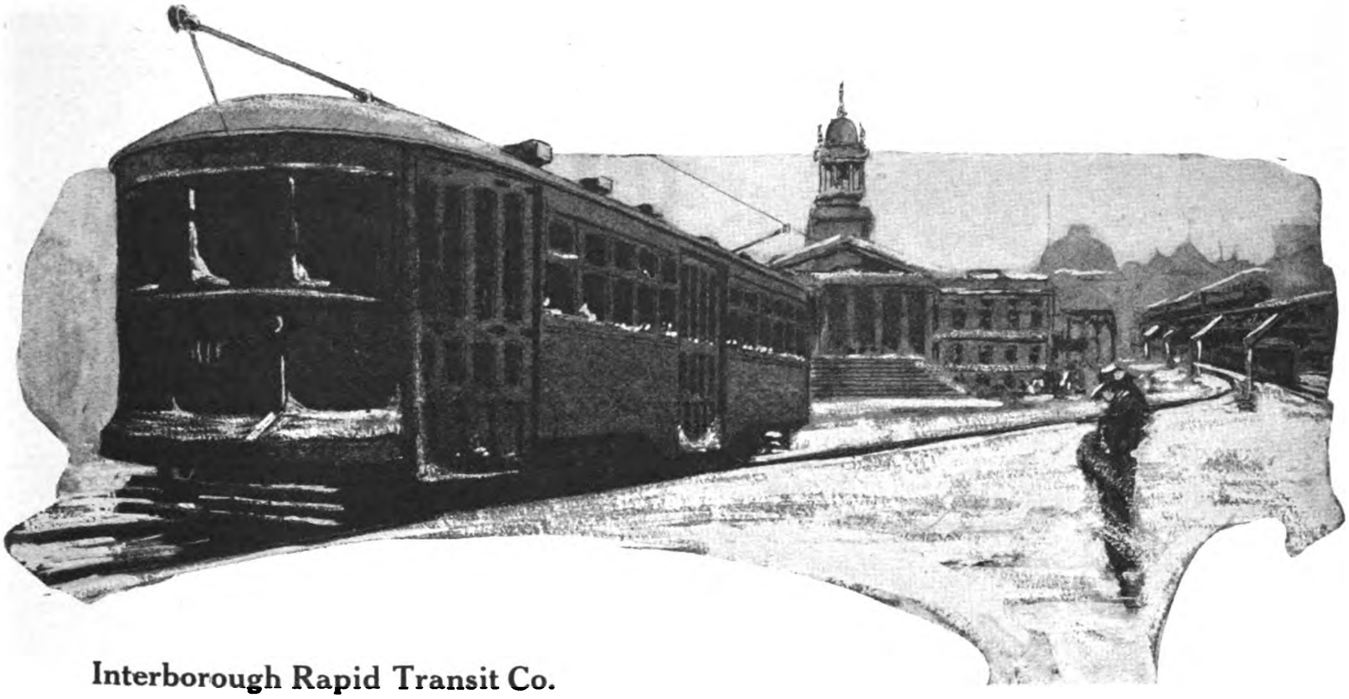
It will pay you to let us submit quotations on your 1924 requirements—first, because our large production enables us to fix most attractive prices, and second, because Flood City products will give unusually long and extremely satisfactory service.

These two factors make Flood City Specialties most attractive and economical.

Write today

FLOOD CITY MFG. CO.
Johnstown, Pa.

With a keen eye to "heat maintenance"



Interborough Rapid Transit Co.

Brooklyn Subways and Street Cars

Public Service Railway of N. J.

New York Central Lines

Long Island Railroad

and other famous systems use

GOLD CAR HEATERS

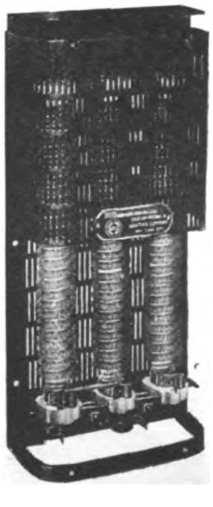
After all, it's a pretty big item, this difference between 30° and 60° F. in winter cars. Figuring 30 or less heaters to a car, it's easy to see where even a slight efficiency "leak" will mount up on a season's operation.

And so, when such experienced and successful operators, as those mentioned above, specify Gold Car Heaters, it is mighty strong evidence of real operating economy in practical every day service.

The Gold Car Heating and Lighting Company has a record of 12,000 heaters that have required less than $200 worth of repair parts over a period of 11 years. These heaters were installed by a single railway company which buys all repair parts directly from the manufacturer.

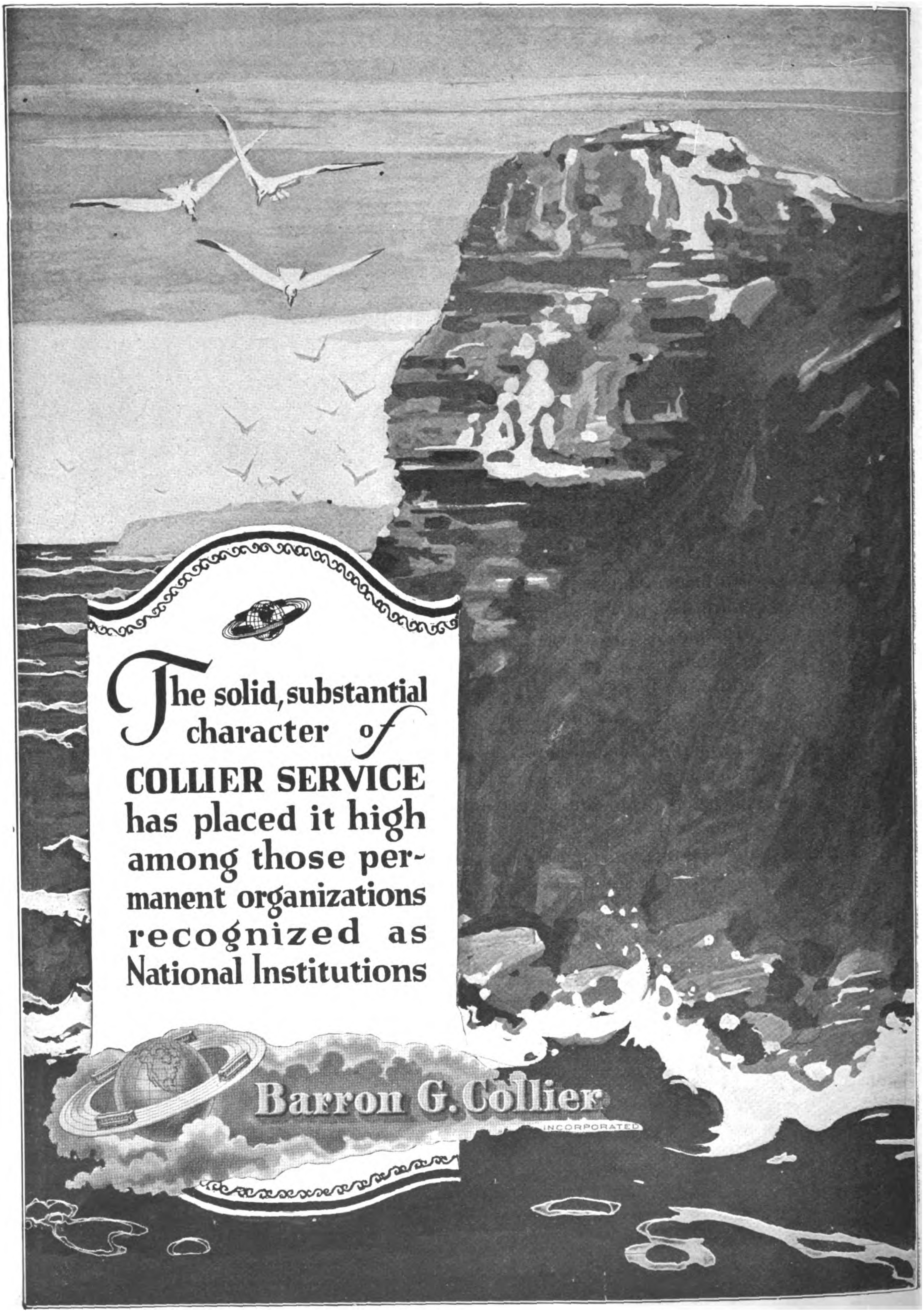
Illustrated herewith are the three types of which 4,800 were supplied for the Brooklyn City Railroad Company's new cars. All types of heaters have interchangeable coils where permissible.

We manufacture all types of heaters adapted for every class of railway service from trackless trolley to railroad car; also for waiting rooms, etc.



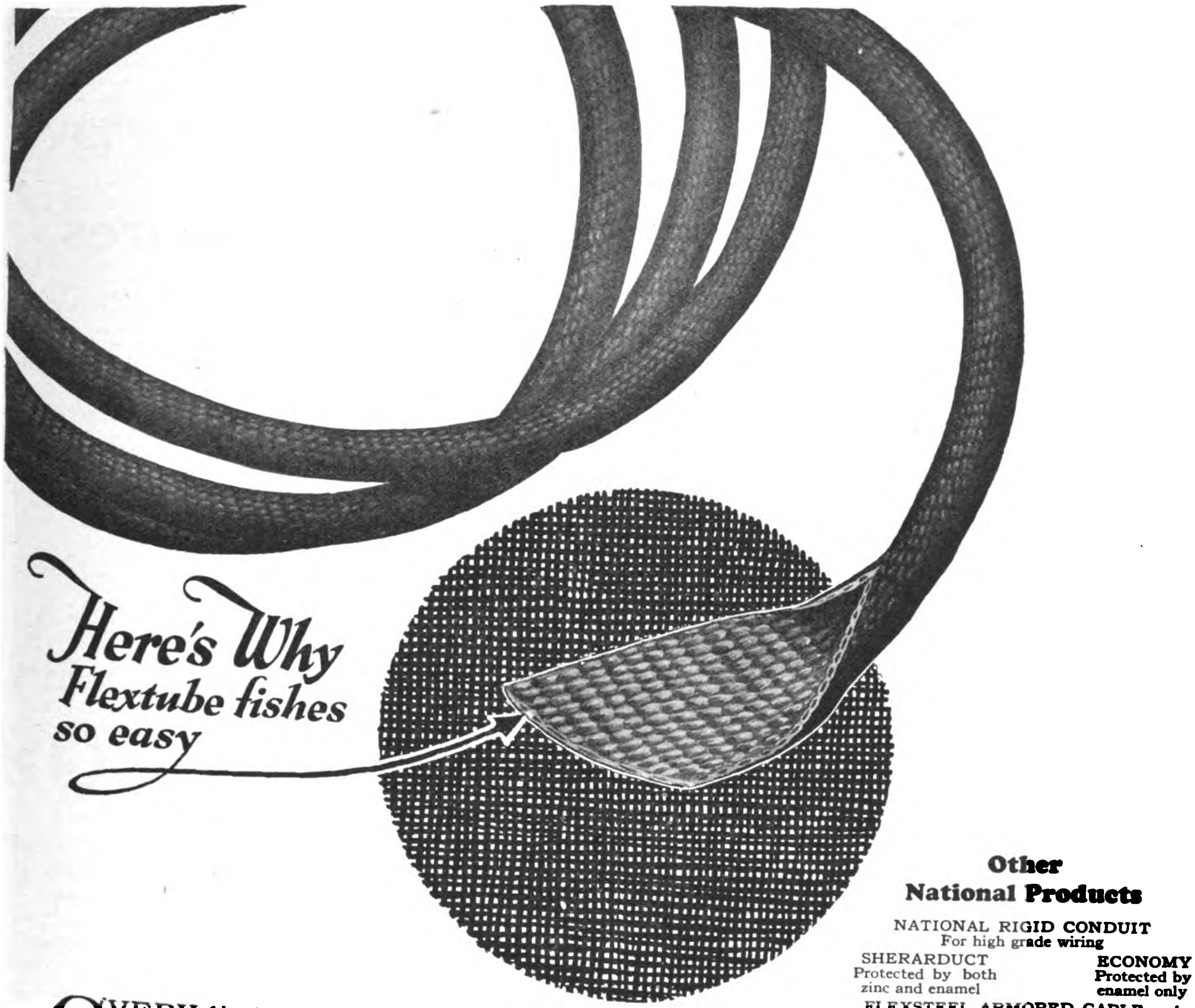
Write for proposition

GOLD CAR HEATING & LIGHTING CO.
Brooklyn, N. Y.



The solid, substantial character of
COLLIER SERVICE
has placed it high among those permanent organizations recognized as National Institutions

Barron G. Collier
INCORPORATED



Other National Products

NATIONAL RIGID CONDUIT
For high grade wiring

SHERARDUCT Protected by both zinc and enamel	**ECONOMY** Protected by enamel only

FLEXSTEEL ARMORED CABLE and FLEXIBLE METAL CONDUIT
For high class work at minimum cost
NATIONAL METAL MOULDING and FITTINGS
For circuit extensions and surface wiring
NATIONAL INSULATING BRACKETS
For service entrances and similar uses
NATIONAL CONDUIT and CABLE FITTINGS
Locknuts—Bushings—Box connectors and other items
NATIONAL OUTLET BOXES
a box or cover for every need
LIBERTY WIRES, CABLES and CORDS
For 600 volts or less
LIBERTY AUTOMOBILE WIRE
AUTO-STEELFLEX METAL CONDUIT
For the electrical circuits of motor vehicles
NATIONAL CARBURETOR, HEATER and EXHAUST TUBING
For motor vehicles

EVERY little "roller" in the tough, solid wall of FLEXTUBE is an individual glider—hundreds of them to speed the wire along.

The wire fairly skates over this continuous non-friction surface. No hitch, no hesitation. FLEXTUBE makes wiremen wonder, if they have never installed it before, where they ever heard "it's a hard job to fish non-metallic conduit."

You take away all the trouble, and nine-tenths of the "push and pull," when you install FLEXTUBE. It is the Non-Metallic Conduit that has taken every last kink out of fishing.

Just see that you get FLEXTUBE on your next order calling for non-metallic conduit. You will thank yourself sincerely on the very first job you fish.

National Metal Molding Company

WORLD'S LARGEST PRODUCERS OF ELECTRICAL CONDUITS AND FITTINGS

1148 Fulton Building, Pittsburgh, Pa.

Represented in All Principal Cities [4]

NATIONAL PRODUCTS

FLEXTUBE

RUTLAND RAILWAY LIGHT & POWER CO.
YAKIMA VALLEY TRANSPORTATION CO.

SOUTHWEST MISSOURI RAILROAD CO.
100 Detachable Five Cent Fare Coupons
1923

Globe Ticket Features

Accurate Numbering

High quality Printing

Protection against Counterfeiting

Satisfactory Perforation

Delivery on Time

and don't forget the Transfers

GLOBE TICKET COMPANY

makers of tickets and checks since 1873

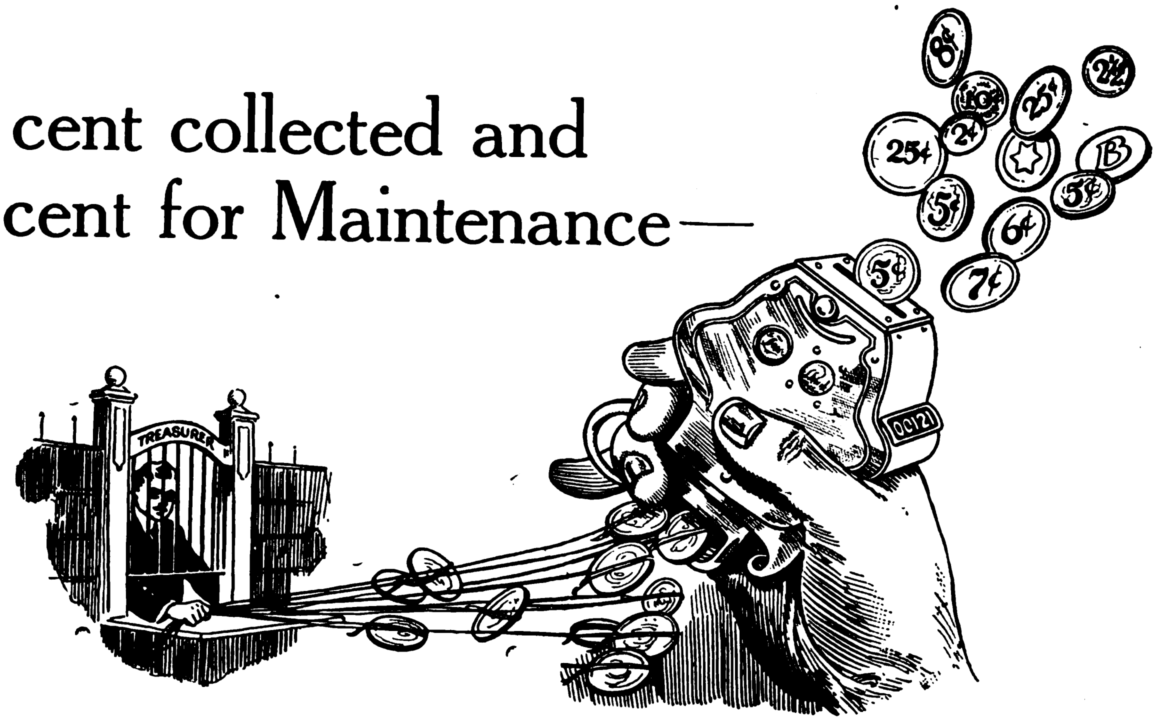
116 N. 12th St., Philadelphia, Pa.

Los Angeles New York San Francisco

NEW YORK STATE RAILWAYS
ROCHESTER LINES
ONE 7¢ FARE

GOOD ONLY UNTIL
002800
MAR.
7 AM
6 AM
9 AM
8 AM
11 AM
10 AM
12 NOON
GLOBE TICKET COMPANY, PHILA. PA.

Every cent collected and Not a cent for Maintenance—


TREASURER
25¢
8¢
10¢
2¢
25¢
2½
5¢
B
5¢
6¢
7¢
5¢
00121

with the new capacity

ROOKE Automatic Register

Punches and fare boxes; tickets and ticket-holders; complicated receipt slips and accounting systems! Stop to think what they cost, on the yearly basis, in maintenance and general overhead, not considering the loss through inefficiency.

Then figure the savings on this new plan — a complete ROOKE AUTOMATIC REGISTER SYSTEM for every car, bus and interurban you operate. One simple, standardized collecting device that misses no fares, and helps the passenger, the conductor and the company by making fraud almost impossible. One simple accounting system for all cars and fare schedules.

And remember this! You pay no maintenance with the ROOKE SYSTEM—not a cent.

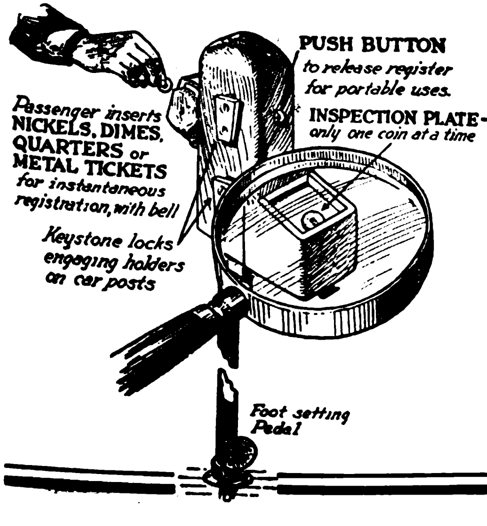
We'll quote a low hire rate on a complete installation and your fare collection worries and expenses stop at that.

We do the maintaining, the repairing and supplying of sufficient spares to meet any emergency.

One large company now uses 973 ROOKE registers. They operate scores of buses collecting nickels, dimes and quarters; hundreds of prepayment, pay-enter, pay-leave cars; hundreds of one-man cars; street collections, etc., collecting nickels, dimes and metal tickets. Standardization on one register, one method of accounting, etc., not only makes possible large economies in operation, but holds fast and *develops a quality of passenger co-operation impossible with any other method of fare collecting.*

From the passenger's point of view, the ROOKE SYSTEM becomes more than a convenience—it becomes a habit. He likes the simplicity of it, the easy efficiency it affords. Soon he always has his fare ready to slip in.

Write now for full details of the ROOKE SYSTEM and let us quote on an installation to meet your needs. We'll be glad to cooperate.


PUSH BUTTON
to release register for portable uses.
INSPECTION PLATE-
only one coin at a time
Passenger inserts NICKELS, DIMES, QUARTERS or METAL TICKETS for instantaneous registration, with bell
Keystone locks engaging holders on car posts
Foot setting Pedal

Best for "SAFETIES" Too!

For safety cars—*one-man cars* or *one-man buses*—where hands or feet are otherwise busy, the ROOKE Standard Register fits in a special stand or holder and is operated, optionally, by either hand or foot.

But it is instantly removable to "go after" missed fares or when the operator changes to another car.

The ROOKE Register is all that a fare box is, and more, because it is so portable and universally applicable to meet all conditions that standardization is possible in both collecting and auditing. It causes the passenger to register his own fare whether he does it when he enters or leaves or after he has slipped into a seat.

Rooke Automatic Register Co.
Providence, R. I.

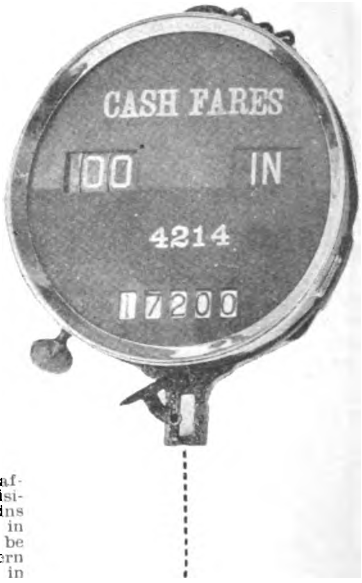
PEREY
TURNSTILES
and
AUTOMATIC
PASSIMETERS

and instantaneous visible registration equipment expedites handling of passengers and fares

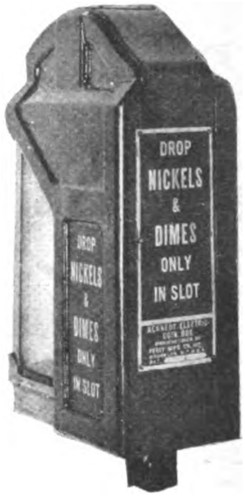
All the latest developments in fare-collecting devices and passenger-handling methods, are embodied in Perey Equipment. Our long experience in this field enables us to achieve the practical, mechanical application of new and progressive ideas.

The devices illustrated here are but a few of the many Perey leaders. Let our experts help you on your equipment problems. Consultation and service gladly furnished.

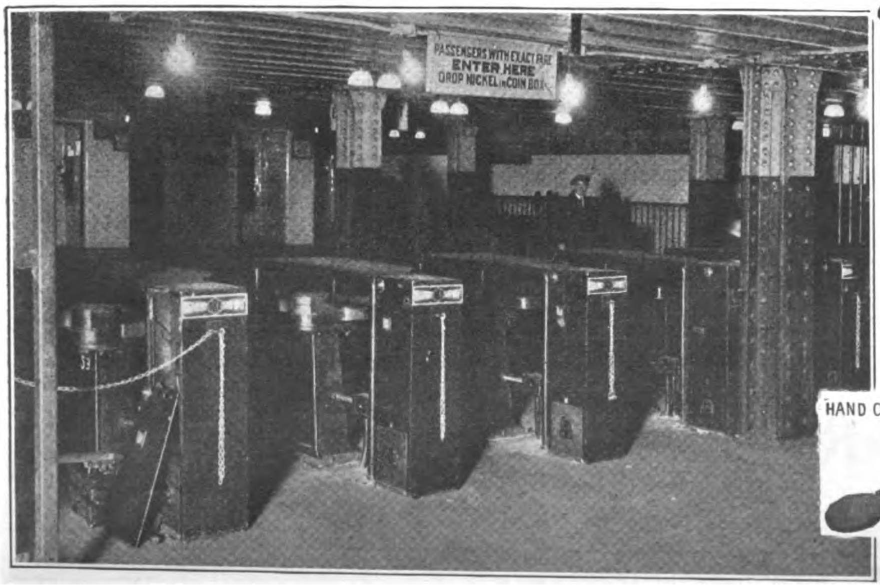
Perey Manufacturing Co., Inc.
30 Church St., New York City

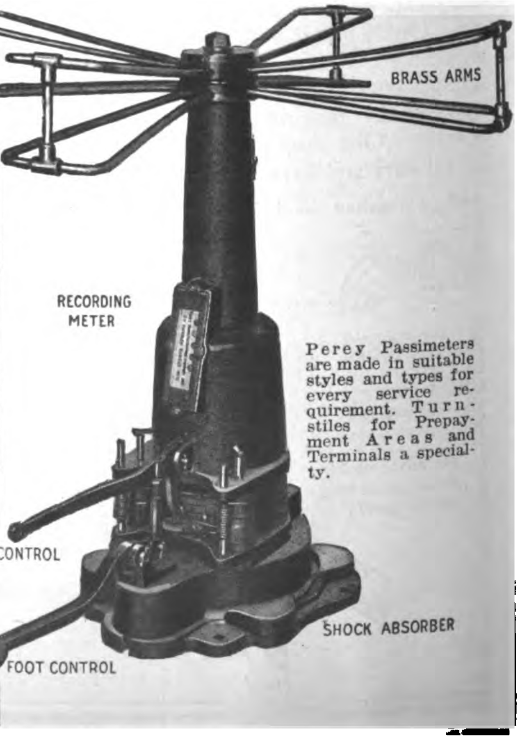

CASH FARES
00
IN
4214
17200

This new combination affords instantaneous visible registration of coins as they are inserted in the fare box. Can be adapted to any modern standard register now in service. Box handles nickels and dimes, or tokens.


DROP NICKELS & DIMES ONLY IN SLOT

Latest type Perey Automatic fare collecting and registering passimeters used by Brooklyn-Manhattan Transit Corp.


PASSENGERS WITH EXACT FARE ENTER HERE DROP NICKEL IN COIN BOX


BRASS ARMS
RECORDING METER
HAND CONTROL
SHOCK ABSORBER
FOOT CONTROL

Perey Passimeters are made in suitable styles and types for every service requirement. Turnstiles for Prepayment Areas and Terminals a specialty.

Memorize the Label!

BECKWITH-CHANDLER'S

Varnishes and Colors

This label marks a superior grade of varnishes and colors manufactured to a consistent standard of quality for maximum durability. These materials are known and used in the paint shops of leading steam and electric railways.

For every part of the car, from roof to trucks, inside and out there is a Beckwith-Chandler finish which will satisfy.

Flat color and varnish systems—enamel systems—color varnish systems. For brush or spray application.

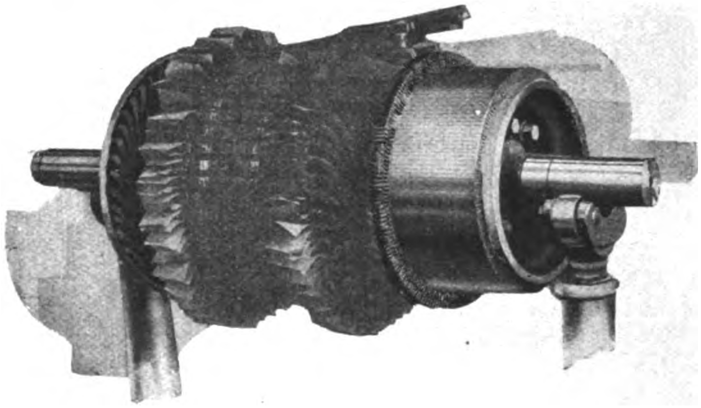
Samples on request.

BECKWITH-CHANDLER CO. VARNISHES

BECKWITH-CHANDLER CO.,
Manufacturers of
Highest Grade Varnishes,
NEW YORK, N.Y. — NEWARK, N.J.

Pale Headlining Varnish
White Headlining Enamel
Truck Paint (all colors)
Roof Paint (all colors)
Japan Gold Size (for lettering)
Imitation Gold Enamel (for lettering)
Railway Outside Enamels (all colors)

Motor and Truck Parts



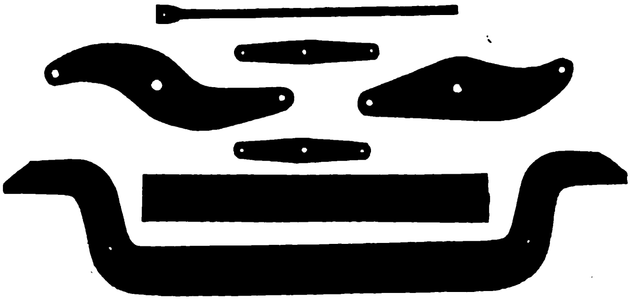
Add our resources to your own!

For thirty years this company has served the electric railway industry, our average production being more than 75 per cent electric railway supplies.

And we want electric railway men today to feel more than ever, that Columbia Service is practically a branch of their own organizations. That they may use Columbia Shops as they would use their own, being assured of even more careful attention to their needs; and of all the skill that an up-to-date plant and carefully trained experts can guarantee.

We hold complete stocks of standard motor and truck parts, and Columbia Specialties, ready for immediate shipment in emergency.

Work of any size which is not standard can be handled in the shortest time that modern methods and long experience have made possible.



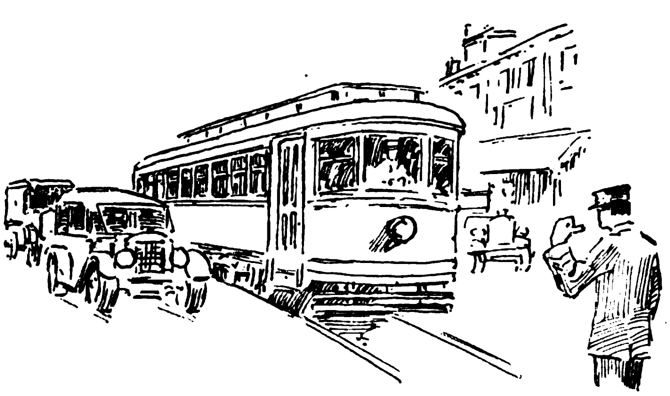
COLUMBIA

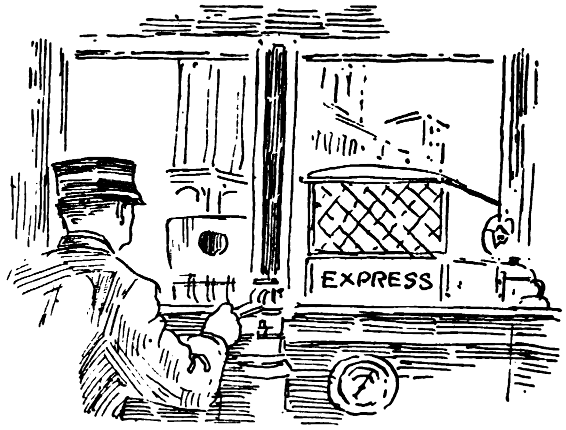
Commutators (all sizes and types)
Armature and Field Coils
Brush Holders
Armature Axle and Journal Bearings
Gear Cases (Steel and Malleable Iron)
Resistance Grids
Control Fingers and Burning Segment Tips
Terminals of all Types

Columbia—A Service of Conservation and Construction

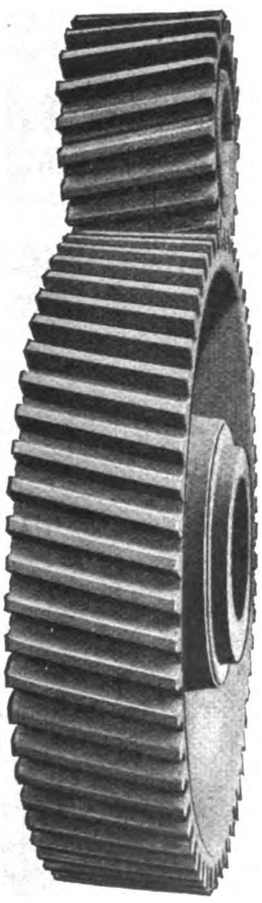
Columbia Machine Works

3313 Atlantic Ave., Brooklyn, N. Y.





Save the motors with Nuttall Standard Helical Gears



First, second—fifth notch on the controller, and a shock goes through the car as the motors gather speed!

That's where the trouble begins, that shock of acceleration that is inevitable with spur gearing. It springs bolts, strains bearings, loosens insulation, cuts gear life and motor life, and piles up maintenance.

Not only the motors suffer; body work suffers too, and soon begins to creak, soon needs "touching up."

Nuttall BP Helical Gears will stop this profit leak. The meshing of the teeth is like the turning of a screw—smooth, vibrationless, noiseless, shockless. There is no grinding and no chattering.

The secret lies in the 7½ deg. Helix Angle; the long and short Addendum tooth; and the famous Nuttall BP Heat Treating Process.

The West Penn Railways have one set of Nuttall Helicals among the many they use with a 500,000 mile record to their credit. Practically every traction property in the country is using helical gears.

We'll be glad to cooperate in *proving* their economy on your cars. Consult us.

Write for our Helical Gear Book

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co. Ltd., Montreal and Toronto.

MILLER TROLLEY SHOES

What a properly conducted test will show!

Savings—More mileage from the contact;—and the slide is cheaper to renew than a copper wheel. No bushings—no lubrication required.

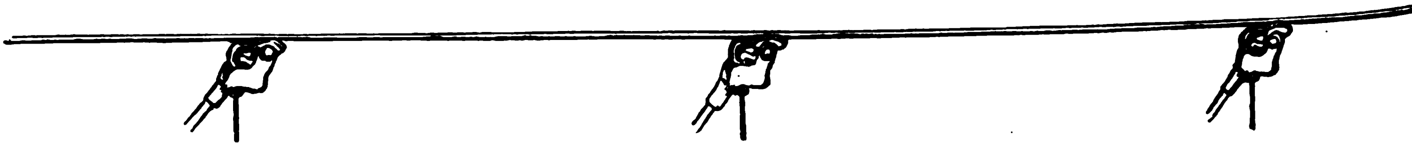
Less Wire Wear—Smooths the wire surface to a glossy finish, then slides without arcing or pitting. Less trolley tension, is required.

Dewirements Eliminated—Clings to the wire on curves and at top speeds. Prevents dewiring accidents.

Noiselessness—Eliminates the vibration and rumble of the trolley contact. It's quiet.

Steady Current—Delivers current at full unbroken voltage to equipment. You can see the difference in the steadiness of the lights.

MILLER TROLLEY
295 COLUMBIA ROAD,
Western Representative: **Economy Electric Devices Co.**

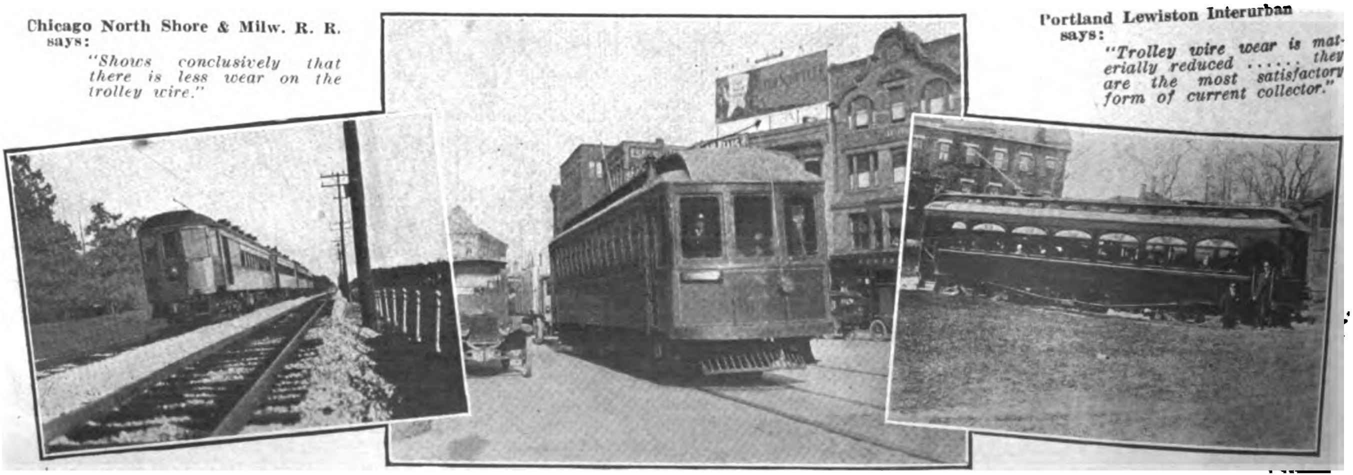


Every one of these roads has been

Hudson Valley Ry. Co., says:
"No dewirements, more mileage, better contact."

Chicago North Shore & Milw. R. R. says:
"Shows conclusively that there is less wear on the trolley wire."

Portland Lewiston Interurban says:
"Trolley wire wear is materially reduced ...... they are the most satisfactory form of current collector."



MILLER TROLLEY SHOES

How to conduct a really conclusive test!

First—Change the line you are testing entirely to trolley shoes. Wheels operating on the same wire roughen it, causing copper to come off onto the trolley shoe slide. Shoes alone will put a hard glossy surface on the wire.

Second—Reduce the trolley spring tension nearly one half. The shoes will cling to the wire without excessive pressures.

Third—Take your trolley wire measurements *after* the wire is polished smooth.

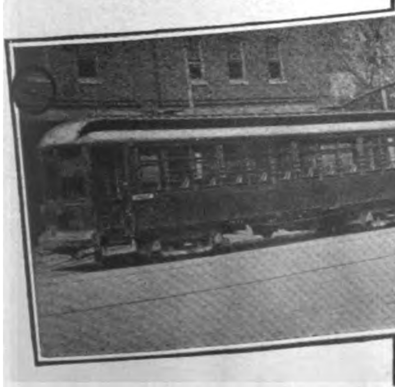
SHOE COMPANY
BOSTON-21, MASS.
1590 Old Colony Bldg., Chicago, Ill.

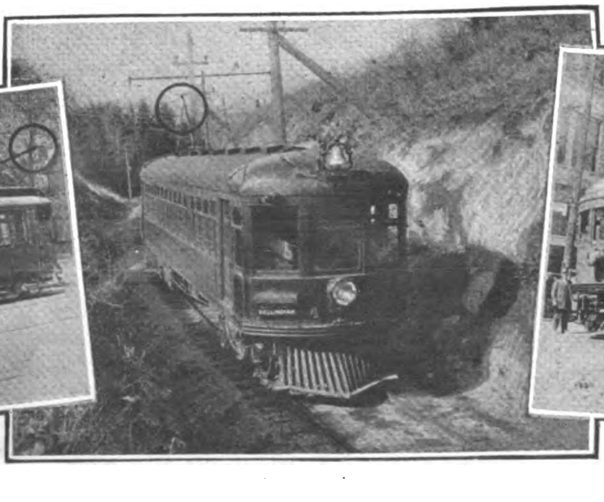
using Miller Trolley Shoes for years

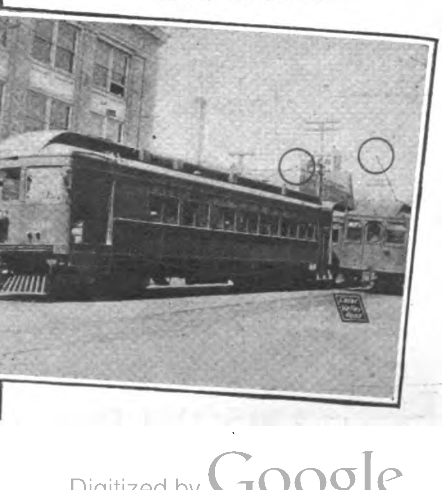
Pacific-Northwest Traction Co., says:
"Give much better and more constant contact and are more economical than wheels."

Waterloo Cedar Falls & Northern Ry., says:
"Have been using them on interurban lines for past three years and find them entirely satisfactory."

Knoxville, Railway & Lt. Co., says:
"We consider them more economical than wheels."







Samson Spot Trolley Cord always in stock

Yes! It's—

SAMSON SPOT TROLLEY CORD

Trade Mark Reg. U. S. Pat. Off.

Samson Spot Trolley Cord (waterproofed) is the cord for maximum wear under hardest service conditions. Its firm hard braid and smooth finish protect it from abrasion. It is non-shrinking, and will not swell or stretch. Roads which use this product do not require very much because it lasts so long.

Trade Mark Reg. U. S. Pat. Off.

SAMSON

Bell and Register Cord

Durable, solid braided cord with a smooth finish which offers greatest resistance to wear. Made in drab or mahogany colors or in white as desired. Wire center optional.

Send for samples and prices.

SAMSON CORDAGE WORKS, 88 Broad Street, Boston, Mass.

Figured big– in lower "safety" costs!

The five exclusive Earll Catcher and Retriever features, which while making utmost protection a certainty, have cut maintenance time and cost to practically nothing.

(1) No-wear Check Pawl.
(2) Free-winding Tension Spring.
(3) Ratchet Wind.
(4) Emergency Release.
(5) Perfect Automatic Lubrication.

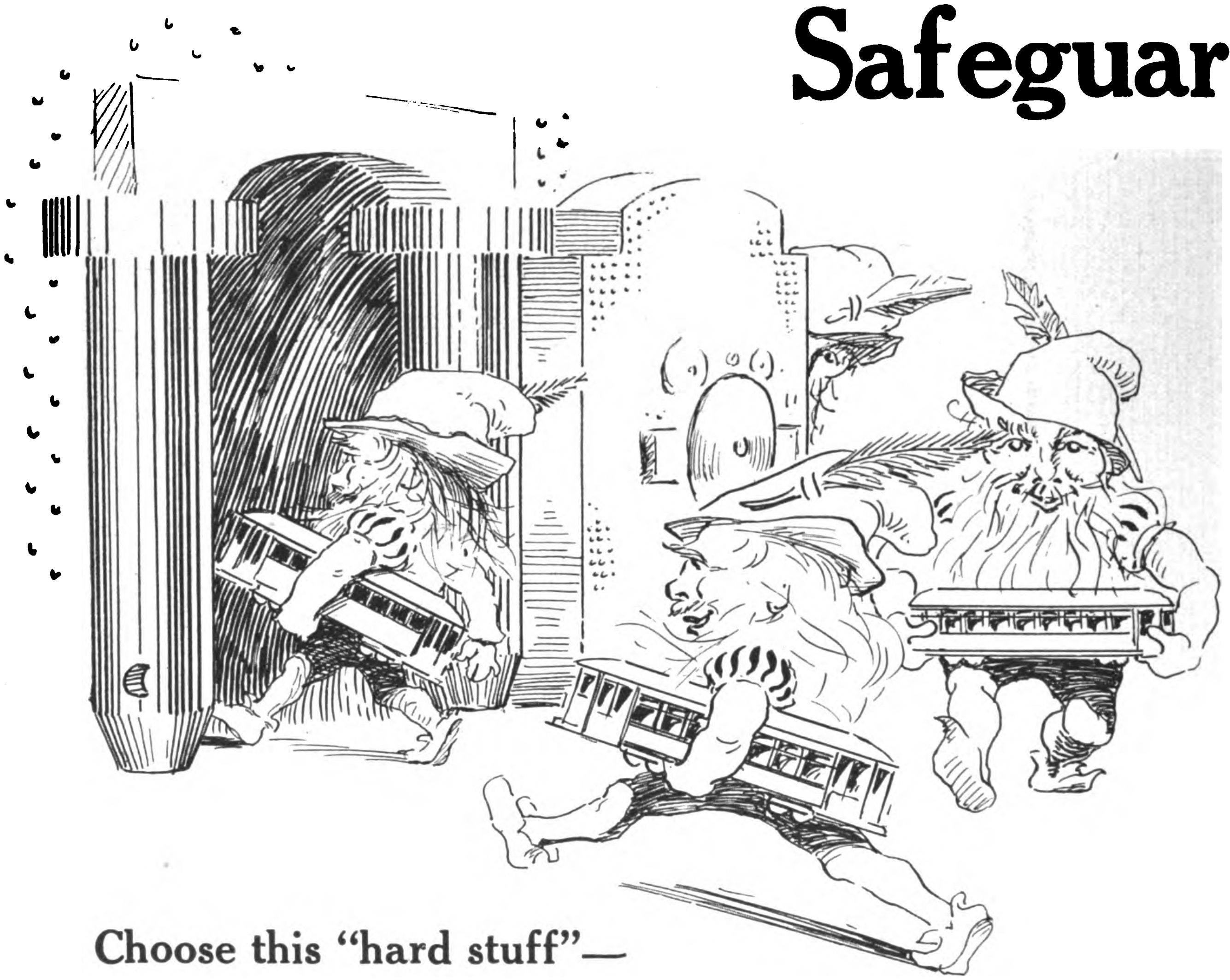
You'll want to know more about this "Big Five." They're saving money for many of the country's largest operators. Write now for the full story. We'll show you in facts and figures.

Canadian Representatives	*All Other Foreign Countries*
Railway & Power Engineering Corp'n 133 Eastern Ave. Toronto	International General Electric Co. Schenectady, N. Y.

EARLL CATCHERS & RETRIEVERS

C. I. Earll, York, Pa.

Safeguard



Choose this "hard stuff"—

it's Boyerized

- Brake Pins
- Brake Hangers
- Brake Levers
- Pedestal Fulcrums
- Center Bearings
- Side Bearings
- Spring Post Bushings
- Spring Posts
- Bolster and Transom Chafing Plates
- McArthur Turnbuckles
- Manganese Brake Heads
- Manganese Truck Parts
- Bushings
- Bronze Bearings

equipment as you safeguard your capital—

BOYERIZE!

You take no chances with the capital of your company. Great steel vaults, armored and re-armored, keep it safe in your bank.

Do you take the same pains to insure the safety of valuable equipment on the road? Costly accidents; undue wear and tear; lawsuits and loss of goodwill,—they're all pretty active in stealing hard earned profits.

But there's one kind of armor that these profit "thieves" can't get through. That's the hard, glossy, armor-plate surface of Boyerized Car Parts.

Maybe you'll smile when we tell you that Boyerized parts outwear steel *three to four times;* but it's true. Not only is it a case of obvious "last cost" economy, but of safety to property and lives as well,—a big cut on the "Injuries and Damages" account.

The McArthur Turnbuckle

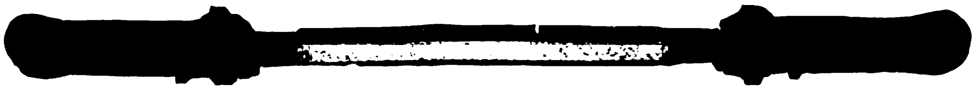
You won't have to re-fit the brake rigging with new turnbuckles, if you specify McArthur Turnbuckles in the first place. They will last as long as the truck itself.

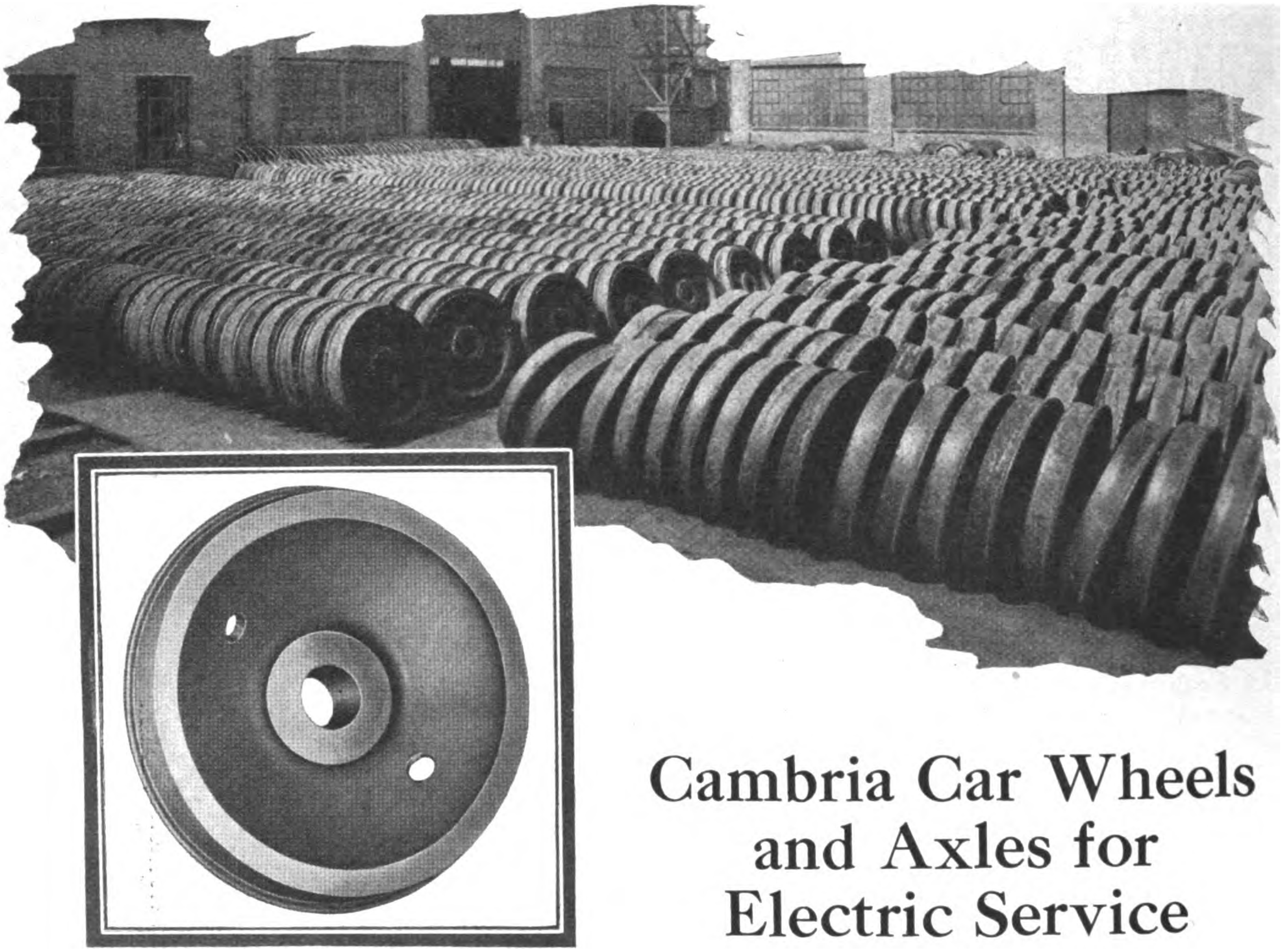
More than that—the old-style jam-nut idea has been scrapped, and an efficient spring-equipped split-clamp principle has been substituted. Now it only takes a pocket-wrench and a moment's time to make an adjustment, and tighten it up to stay.

Send for Sample to try.

BEMIS CAR TRUCK COMPANY
Electric Railway Supplies
SPRINGFIELD, MASS.

Representatives:
Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.





Cambria Car Wheels and Axles for Electric Service

ROLLED steel wheels for electric railroad service are made in our Cambria Wheel Plant, which is fully equipped for making the highest grade wheels that can be produced.

Our wheels give the maximum of service and satisfaction because the greatest care is used, not only in the manufacture of the wheel, but also in the preparation of the steel that goes in it.

The steel is thoroughly worked and kept at the proper temperature throughout all rolling and forging operations.

Wheels are sized in a solid die. thus eliminating all eccentricity.

The use of ingots with large radii at corners eliminates defects which ordinarily appear in the rolling operations.

A large quantity of rolled steel wheels are regularly carried in stock to facilitate deliveries. These wheels are of standard sizes and can be bored to meet customer's requirements.

* * * *

Cambria Axles for street, interurban, subway and elevated cars and armature shafts for electric service are made in the Bethlehem Axle Plant at Johnstown, Pa., to meet any reasonable specification: treated or untreated; solid or hollow bored; smooth forged only; rough turned all over; or rough turned on journals and wheel seats.

BETHLEHEM STEEL COMPANY, ***General Offices:*** **BETHLEHEM, PA.**

Sales Offices:

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Detroit Cincinnati Chicago St. Louis San Francisco

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of Our Commercial Products

BETHLEHEM

Mr. Railroad Man:

SPECIFY CLEARLY

H-B-LIFE GUARDS

"TO BE MANUFACTURED BY THE CONSOLIDATED CAR FENDER CO."

THIS MEANS MUCH TO YOU

Consolidated Car Fender Co.
Providence, R. I.
General Sales Agents
Wendell & MacDuffie Company
110 East 42nd St., New York, N. Y.

Kalamazoo

trolley wheels and harps

THE VERY FACT that Kalamazoo Trolley Harps and Wheels are made by the largest concern of its kind in the World is in itself an indication of their standard.

Our products are made in a shop devoted exclusively to these specialties. Today we are supplying the major part of the entire demand of the United States. There must be a reason for this, and there *is*. And that is, a high reputation due to high quality.

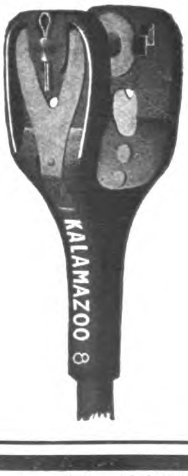
Kalamazoo Trolley Harps and Wheels have been endorsed by the leading electric roads since their inception on the market, over 25 years ago.

THE KALAMAZOO
No 7

Kalamazoo Harps give perfect and continuous contact, and are designed to permit easy replacement of wheels. There is only one cotter pin to be taken out to remove the wheel. They are balanced for easy running and freedom from slippage. They do not wear down and damage the wire, for wire life is more important than wheel life.

Kalamazoo wheels are made of virgin metal—pure lake copper—they are of proper design for the intended service, and are honestly manufactured.

THE KALAMAZOO
No 5



STAR BRASS WORKS

Kalamazoo, Michigan

The largest exclusive manufacturers of trolley wheels in the world

T. S. Q.

says

"I save repair costs."

Tool Steel Quality

The Tool Steel
Gear and Pinion Co.
CINCINNATI, O.

BOSTON & WORCESTER TROLLEY AIR LINE
145
145

Equipped with our

ROLLED STEEL WHEELS AND AXLES

"Not only to make better products but to make them better understood—not only to sell but to serve, assisting those who buy to choose as well as use their purchases—this is the privilege if not the practice of all modern manufacturers."—Vauclain.

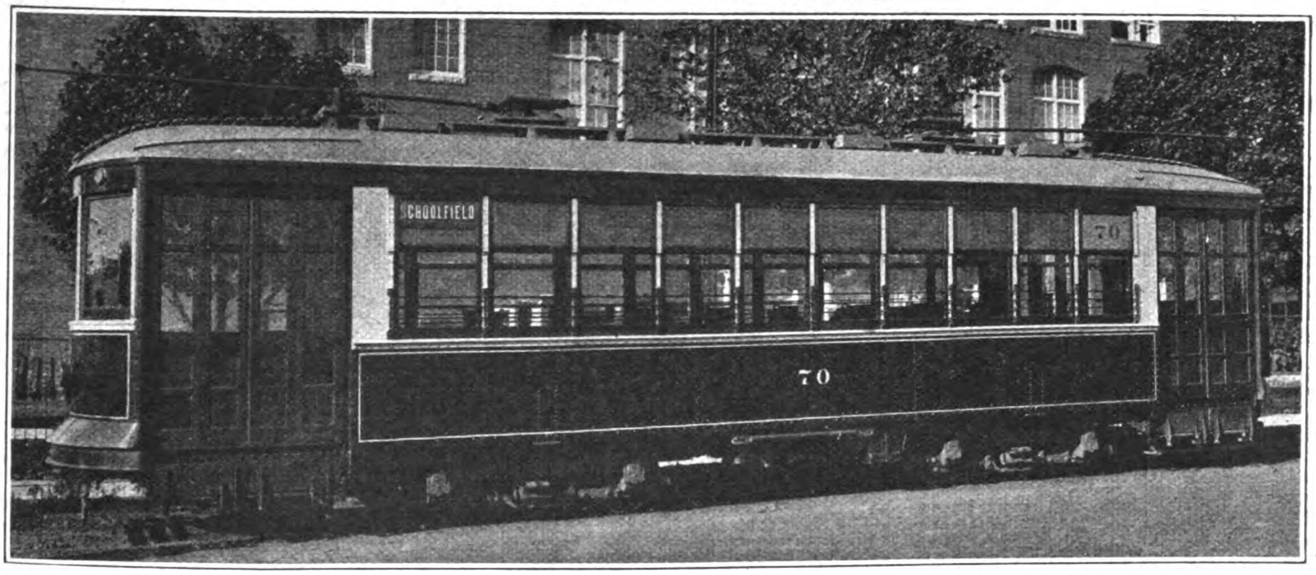
STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES

CHICAGO
ST. LOUIS
HOUSTON, TEXAS
PORTLAND, ORE.
RICHMOND, VA.
SAN FRANCISCO
NEW YORK
BOSTON
ST. PAUL, MINN.
PITTSBURG, PA.
MEXICO CITY, MEX.

WORKS: BURNHAM, PA.



Danville Traction & Power Co., Danville, Va.

"SAFETIES"—big, heavy interurbans,—it makes no difference what your service needs, you'll find Thomas-built cars to meet them *economically*.

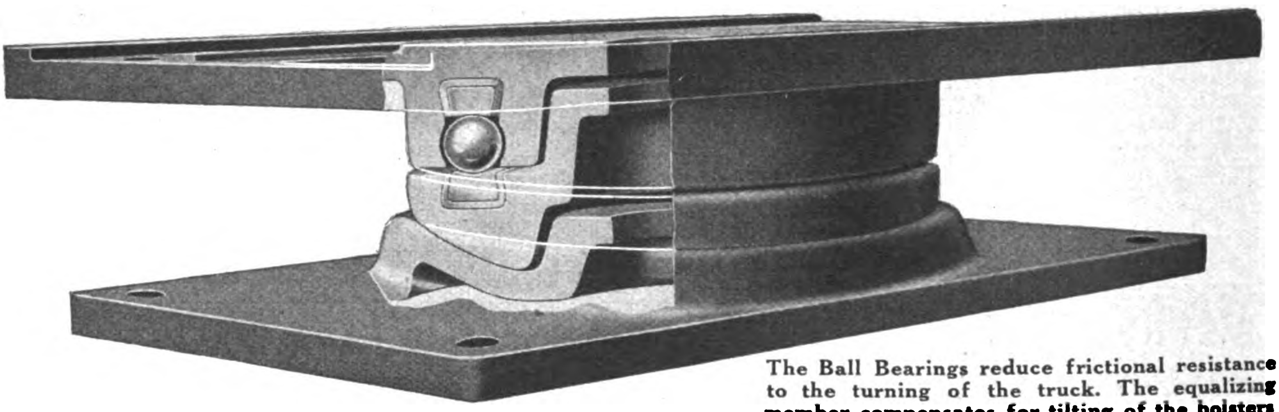
Cars that have been built to help build profits by combining utmost passenger comfort with sound practical design and sturdy road-worthiness.

Thomas-Built "Safeties" especially have won an enviable reputation for maximum operating economy. They are the result of pioneer experience in this field together with a keen appreciation of practical railway requirements.

PERLEY A. THOMAS CAR WORKS
HIGH POINT, N. C.

SYMINGTON

BALL BEARING EQUALIZING CENTER PLATES



The Ball Bearings reduce frictional resistance to the turning of the truck. The equalizing member compensates for tilting of the bolsters and prevents undue concentrated loading on any of the balls.

The Center Plate of Safety and Economy

FLANGES will wear, there is no way known to stop all of this wear.

But a large part of flange wear is caused by the grinding action between wheel flange and rail head in guiding the car around curves and turnouts.

This guiding action is necessary but the pressure between flange and rail should be but little more than that required to overcome the curving resistance of the car—the center plate bearing should have only enough frictional resistance to steady the truck. It should not add curving resistance of its own.

With the Symington Ball Bearing Center Plate frictional resistance to the turning of the truck is kept low, greatly reducing the pressure between wheel flange and rail.

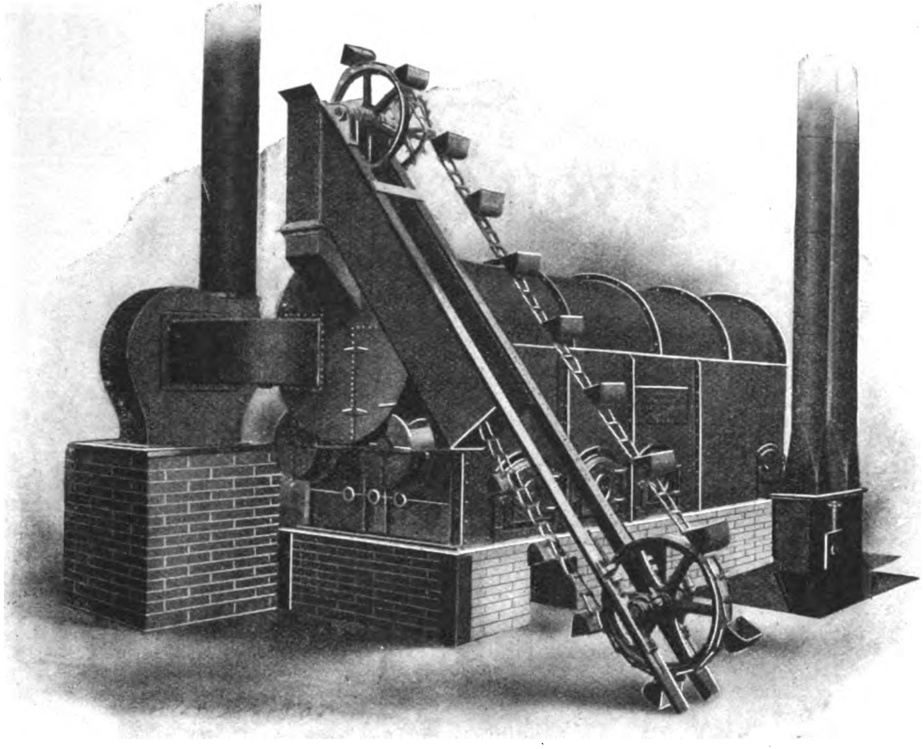
This increases safety against derailments, reduces wear of the rail, increases wheel mileage between renewals and improves economy of operation.

THE T. H. SYMINGTON COMPANY

New York Chicago Baltimore Boston Montreal
WORKS: ROCHESTER, N. Y.

HETHERINGTON & BERNER

INDIANAPOLIS, IND., U. S. A.



Above—A Typical Sand Dryer—8-ton Size

ROTARY SAND DRYERS

SAND ELEVATORS

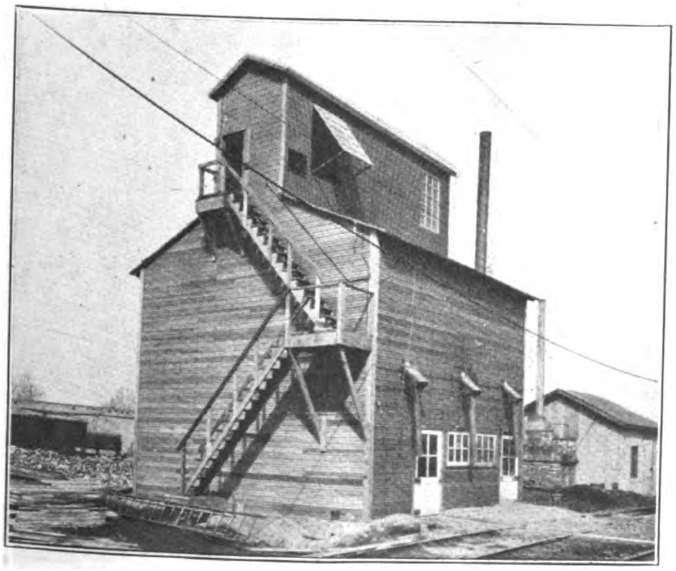
SAND STORAGE BINS

STRUCTURAL STEEL FRAME for SAND HOUSE

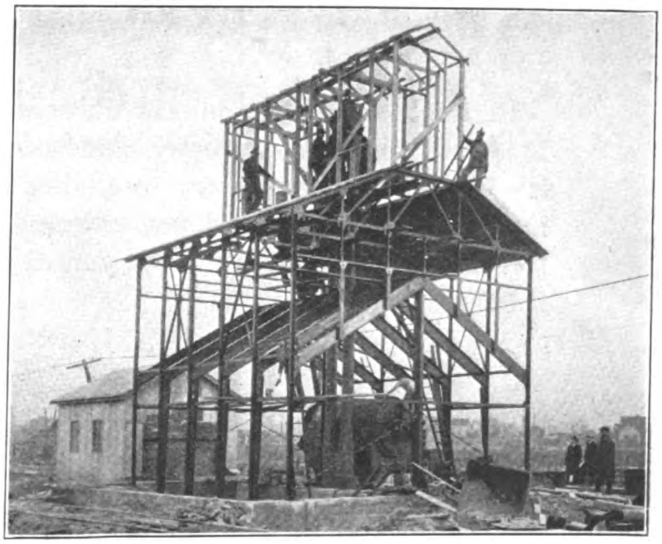
Write for our SAND HOUSE BULLETIN if you have not received it.

PREPARE FOR NEXT FALL'S SLIPPERY RAILS!

—LET US SHIP YOU A SAND HOUSE THIS SUMMER—



This illustration above shows a completed 200 ton capacity sand dryer and storage house,—"sand house"—for short. We furnished the dryer, feed elevator, hot sand elevator, rotary screen with hopper, distributing pipes from hopper, discharge gates and pipes and structural steel frame. The Street Railway Co. provided the foundations and lumber.



The structural steel frame work as illustrated for a 200 ton capacity sand house, forms the skeleton of the structure that is to be completed in wood siding, roof sheathing and bin flooring, as illustrated at the left. Note the roof-like, bin-floor members above the dryer. We can arrange for complete erection of steel and machinery if desired.

One thing less you get with Bermico Fibre Conduit

Handling is one thing which Bermico cannot promise you in abundance. In fact, to each mile you lay there will be exactly 396 fewer lengths of Bermico to handle.

This great saving in labor is made possible by the 8-foot length on which Bermico standardizes. Eight feet instead of the more usual five. No wonder men who use Bermico say, "It is cheapest in the long run"— and the longer your runs the greater the economy.

Bermico Fibre Conduit is durable. It is carefully and accurately made. It is — but naturally we are prejudiced in its favor. Let us send you a sample for your severest testing — so you can satisfy yourself.

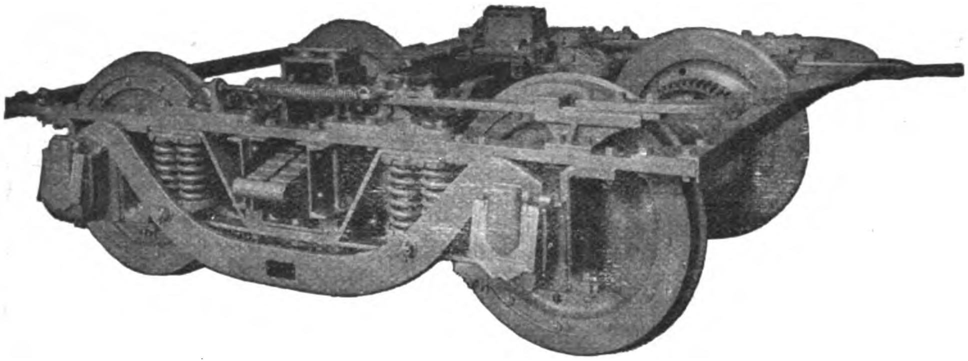
Western Electric Company

OFFICES IN 47 PRINCIPAL CITIES

BALDWIN

Electric Motor Trucks

meet the severe requirements of Japanese and American Railways



Type "A" Truck used on the Osaka Electric Railway and the Osaka Tetsudo Railway of Japan. Similar Trucks are used on many American and other Foreign electric railways.

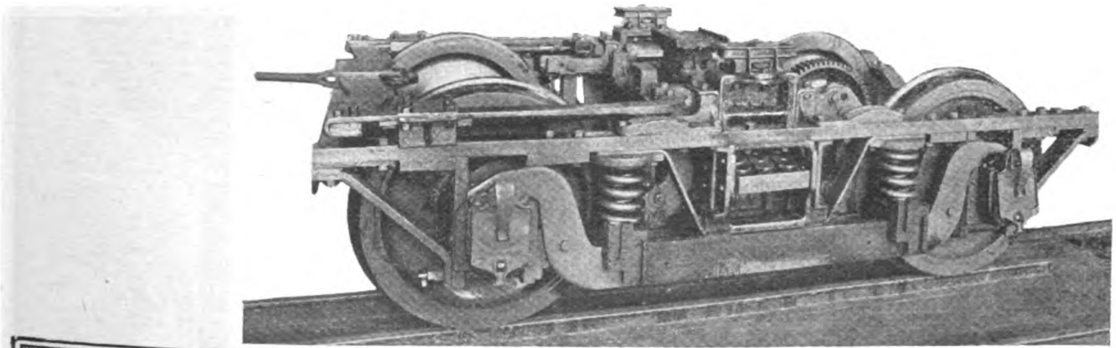
FOR Simplicity, Strength and Perfect Riding Qualities, Baldwin Type "A" and "AA" trucks, with centre pin loads from 25,000 to 30,000 pounds and 30,000 pounds and upwards, respectively, are not to be excelled.

The illustration below shows a Baldwin Truck built for high speed elevated railway service which is meeting the requirements of severe operating conditions.

Detailed information upon request.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U. S. A. **Cable Address, "Baldwin, Philadelphia"**



Built for the Chicago Rapid Transit Co.

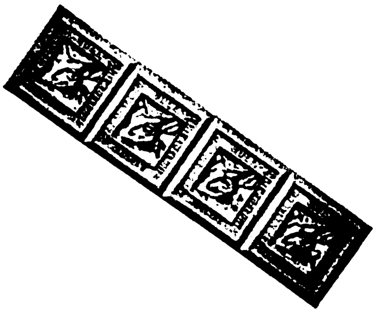
MOTOR TRUCKS

AJAX

BEARING METALS and CASTINGS

TRADE MARK

AJAX PERFECTO



For New Equipment and Repairs, use—

AJAX Car Brasses, whether ARA Standard or of other type are made of alloys of correct formula by the AJAX Process, and exhibit workmanship that is characteristic of all AJAX Castings.

AJAX "Perfecto" Check Plates are tough, will bend before they will break, and give longest possible service.

AJAX Armature Babbitt for motor bearings, especially in street railway work, gives the best results.

AJAX Bull Bearing Alloy is unequalled for lining axles, and gives much longer life than babbitt.

For over 40 years the AJAX Metal Company has been making bearing metals and castings. During these years AJAX Metals have always been made to meet the requirements of the industry Likewise today they are made to stand the heavy loads, high speed service, rapid acceleration and braking which are characteristic of electric railway service. The annual tonnage of AJAX Bearing Metals and Castings used is evidence sufficient that they do it.

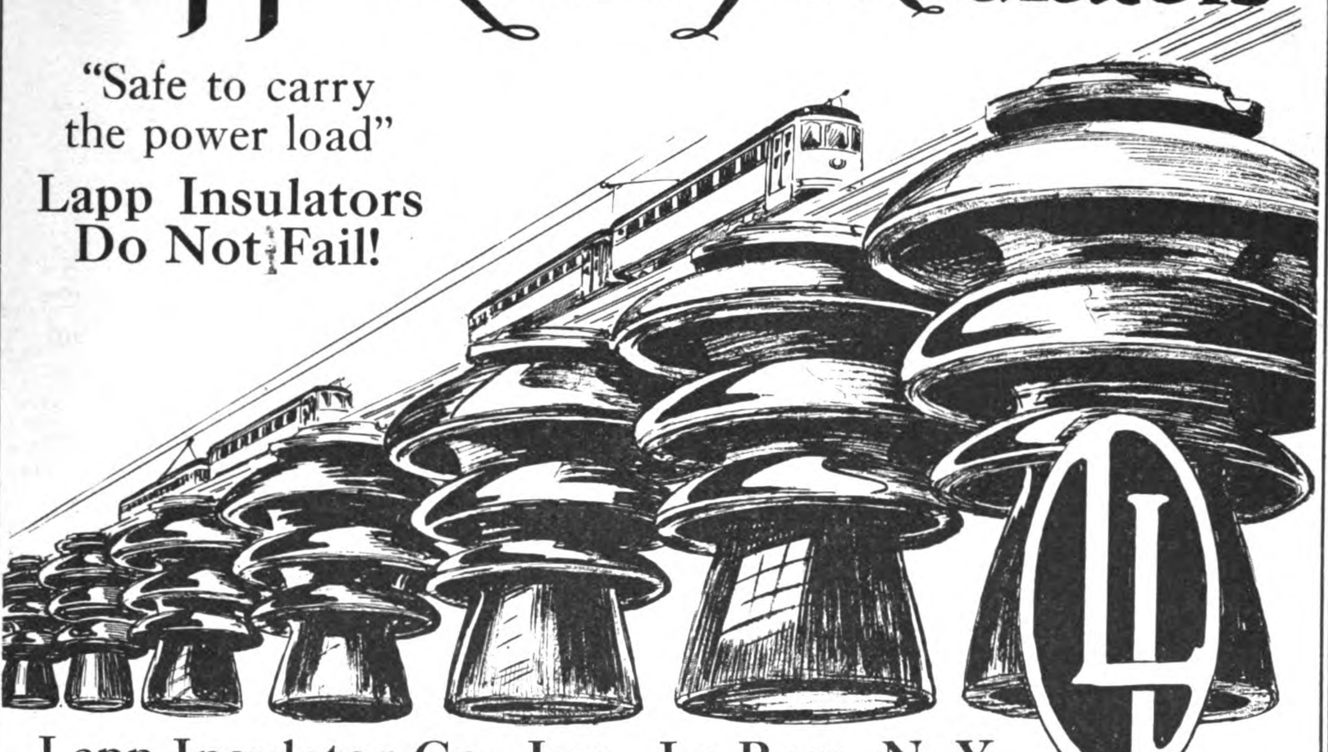
THE AJAX METAL COMPANY

Established 1880

Philadelphia, Pa.

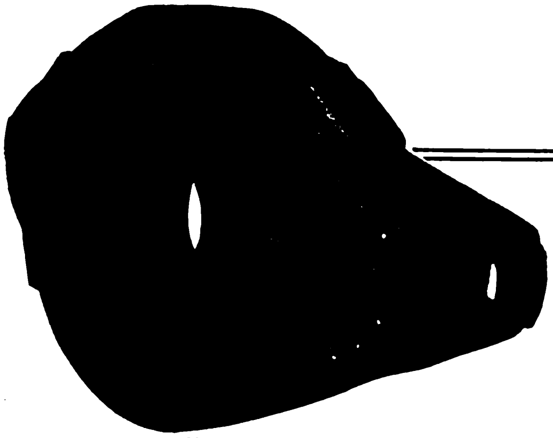
New York Chicago Boston Cleveland

Lapp Quality Insulators



"Safe to carry
the power load"
Lapp Insulators
Do Not Fail!

Lapp Insulator Co., Inc., Le Roy, N. Y.



"Built for Service"
by gear case specialists

Not an incidental side-line, but an exclusive one-line proposition — Chillingworth Gear Cases are designed, manufactured and distributed by a concern of many years experience.

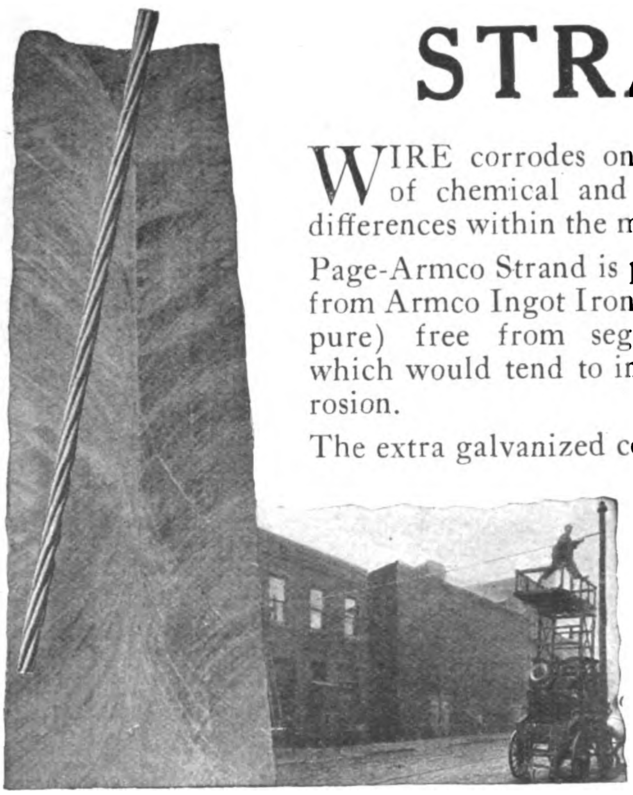
Our seamless steel case affords utmost service endurance because it's vibration-proof, it will not crack or break when bumped, and it is most easily repaired after accidents.

Chillingworth Seamless Steel Gear Cases are made with such accuracy that the halves are absolutely interchangeable, with an accurate fit which makes them dust and grease-tight.

Specify Chillingworth

CHILLINGWORTH
One-Piece
Drawn Steel
Seamless
GEAR CASES

Chillingworth Mfg. Co., 111 Broadway, New York, N. Y.



PAGE-ARMCO

STRAND WIRE

WIRE corrodes on account of chemical and physical differences within the metal.

Page-Armco Strand is produced from Armco Ingot Iron (99.84% pure) free from segregations which would tend to invite corrosion.

The extra galvanized coating on Page-Armco Strand combined with the purity of the wire insures maximum service.

Page-Armco Iron Strand is used as messenger strand, guy wire or strand, telephone wire or strand, trolley span wire, ground wire or strand, telegraph wire and as power transmission conductors.

PAGE STEEL AND WIRE COMPANY
An Associate Company of the American Chain Co., Inc.
Bridgeport, Conn.

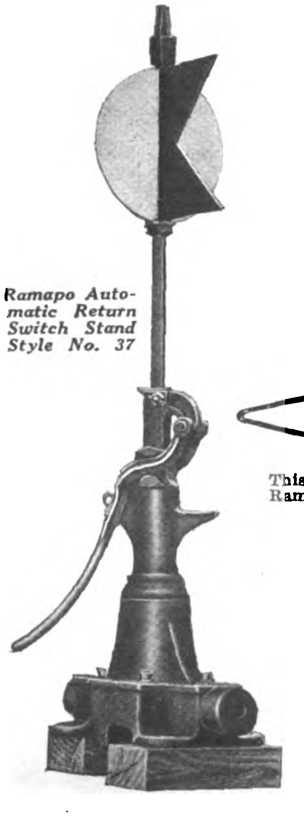
DISTRICT SALES OFFICES:
Chicago New York Pittsburgh San Francisco

MANUFACTURERS OF:

Rods—Armco Ingot Iron and Special Analysis Steels.

Wire—Plain and Galvanized—Rope, Telephone, Telegraph, Bond, Strand, Oxy-Acetylene and Electric Welding Wire.

Fence—Woven Wire for Farm and Railway Right of Way, Wire Links Protection for Industrial Plants, Lawns, Schools and Estates, and Factory Partitions.



Ramapo Automatic Return Switch Stand Style No. 37

Ramapo Automatic Return Switch Stands for Traction Lines

This is the Trade Mark of Ramapo Ajax Corporation

Especially designed for passing sidings on private right of ways, where it is desired that the switch point always remain in the same position after having been run through.

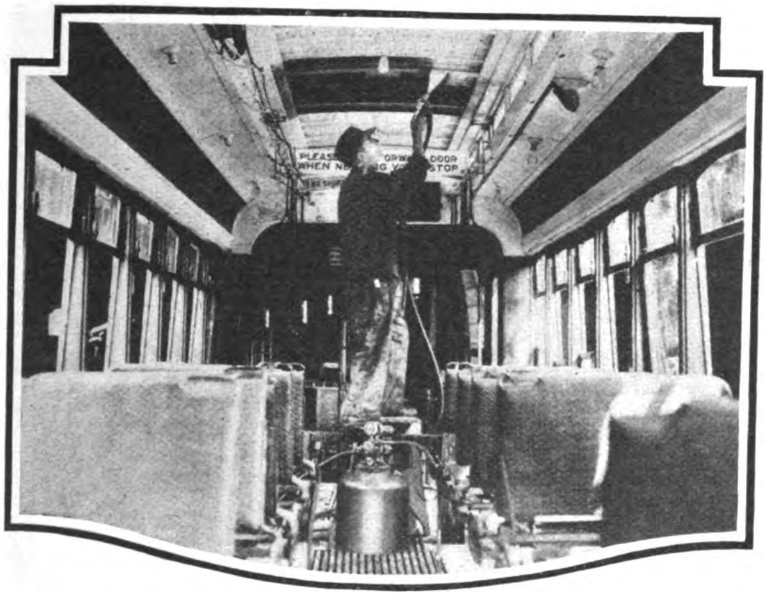
Target always indicates position of switch points, always showing whether the switch points are open or closed or if partially held open by an obstruction.

The throw is rigid. The springs in the base fixture do not intervene between the hand lever, switch stand spindle and switch points. They are a part of the base fixture, to which the throwing mechanism is latched when the hand lever is lowered.

Write for further information or for catalogues on switch stands, switches, frogs, crossings, etc., for tee rail track. Manganese construction a specialty.

RAMAPO AJAX CORPORATION
HILLBURN, NEW YORK
CHICAGO NEW YORK
SUPERIOR, WIS. NIAGARA FALLS, N. Y.
Canadian Ramapo Iron Works, Limited, Niagara Falls, Ont.

"Repainting Done Inside and Out for $125. per Double-Truck Car"



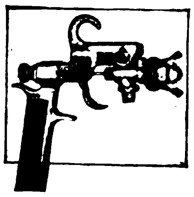
Says the Eastern Massachusetts St. Ry. Co. of Boston.

Quoting further from letter received from the Superintendent of Rolling Stock and Equipment, of this large New England property: "Our company has used the DeVilbiss Spray System of painting for two years. We have by this method been able to reduce our cost of painting very materially * * * and are in a position to paint our rolling stock at shorter intervals."

Improvement in quality of work—saving of time—lowered labor costs, are noteworthy advantages made possible by the DeVilbiss Spray-painting System on electric railway car and equipment painting.

Let us work with you. Interesting operation and equipment facts will be gladly mailed. Address—

THE DeVILBISS MFG. CO.
272 Phillips Ave. TOLEDO, OHIO



New DeVilbiss Spray Gun

This latest DeVilbiss development provides for the most advantageous application of any paint or varnish material. It embraces 17 important, distinctive features, among which are a "Self-centering nozzle," a "Quick detachable spray head," "All parts interchangeable," "Simplicity of design," and "One model for all purposes."

This new Type "A" Spray Gun insures the utmost in spray gun value and service.

DeVilbiss Spray-painting System

[Complete Equipment for Every Painting Requirement]

IRVINGTON VARNISHED Cambric

Seven factors of Quality

High Dielectric Strength Non-Hygroscopic
High Resistance Heat Resisting
Flexibility Chemically Neutral
Maximum Elasticity

The Copper and Steel entering into the manufacture of motors, transformers, turbo generators, etc., never wear out. Oil is renewed, but the only factor that can deteriorate is the insulation, and that in many cases has been good for the life of the equipment where Irvington Varnished Cambric was used. It has stood and will stand the test of time. That is why the large manufacturers insist on Irvington. Ask for samples and prices.

IRVINGTON VARNISH & INSULATOR Co.
Irvington, New Jersey.

Established 1905

Sales Representatives:

Mitchell-Rand Mfg. Co., New York
T. C. White Electric Supply Co., St. Louis
E. M. Wolcott, Rochester
L. L. Fleig & Co., Chicago
Consumers Rubber Co., Cleveland
Clapp & Lamoree, Los Angeles
F. C. Scofield, Toronto

"TIDEWATER"

CYPRESS

"THE WOOD ETERNAL"

gives insurance against a continuous big *labor cost* for renewals and replacements in the many railway uses for lumber.

When you specify and use

ALL HEART

"Tidewater" Cypress

for Ties, Fencing, Trunking, Capping, etc.

you know it will give longer service than any other material. You know, too, how labor costs exceed material costs in almost every case. Of course even "Tidewater" Cypress may eventually have to be replaced. Nothing lasts quite "forever." But in the long service-life you get from all-heart "Tidewater" Cypress you will have *saved* a lot of labor costs in *maintenance alone.*

Anyway, that's why a number of the biggest railways in the country *insist* on All-Heart "Tidewater" Cypress.

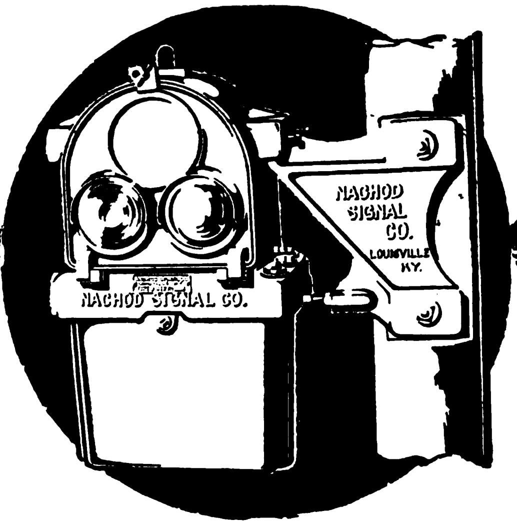
S C M A

TRADE MARK REG. U.S. PAT. OFFICE

"Buy by the Cypress Arrow." Look for this mark on the end of every piece—or on every bundle. Our data is at your service.

Southern Cypress Mfrs.' Association

1265 Poydras Building, New Orleans, La., or
1265 Graham Bldg., Jacksonville, Fla.


NACHOD SIGNAL CO. LOUISVILLE KY.
NACHOD SIGNAL CO.

Keep Your Cars Moving

The manager speaks: "The main thing about operating street cars, and especially on single track lines, is to keep the cars moving and not have them waste a lot of time on switches waiting for meets. This, more than anything else, exasperates and drives away passengers."

Verily, the car on the switch gathers no dividends.

Nachod Signals are invaluable with

Safety Cars

to maintain the short headways that invite the public to ride. Nachod Signals tell the motorman when the block is clear to the next passing siding. Show him when he takes the block that he has stopped an opposing movement. Permit other cars to follow him thru the block, notifying them that the block is occupied and giving each an indication of protection in entering; meanwhile holding stop signals at the other end until the block is again clear.

NACHOD SIGNALS

protect all shifting moves automatically, permitting city and interurban cars to change order at a siding.

They save time by eliminating a stop, since they work at any speed. They operate from overhead contactors at any feasible line voltage and give duplicate indications of lights and disks that cannot be mistaken under any lighting conditions.

Catalog 719 describes Nachod Signals. Write for it.

Nachod Signal Co., Inc., Louisville, Ky.
Manufacturers of Automatic Signals, Highway Crossing Bells and Automatic Headway Recorders.

NACHOD SPELLS SAFETY

INDUSTRIAL
MAINTENANCE DEPARTMENT

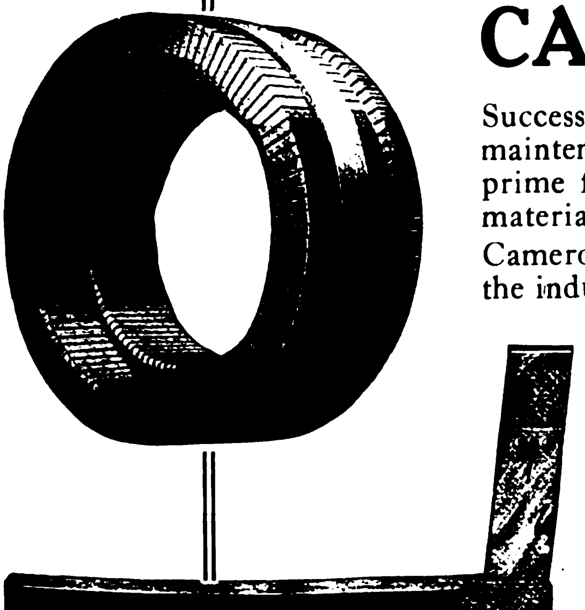
Lowering maintenance costs

THIS INDUSTRIAL ELECTRIC LOCOMOTIVE CRANE on the Boston Elevated Ry., with an operator and two men, handles 540 ties per hour, and piles them 18 feet high. This work formerly took 12 men 2½ hours and they only piled 12 feet high. It handles 18,000 treated wood paving blocks per hour, a job formerly requiring 12 men for 4 hours.

With electro-magnet, clamshell bucket or hook, this crane handles iron and steel castings, scrap, car wheels, rail, trucks, sand, crushed stone and all bulk materials. The INDUSTRIAL is pre-eminent in lowering maintenance costs.

Seventeen types of INDUSTRIAL cranes, capacities 5 to 200 tons, are standardly built. All are fully illustrated and described in our Golden Anniversary Catalog, which will be forwarded to you promptly upon request.

INDUSTRIAL WORKS: BAY CITY, MICHIGAN



Hold Down Maintenance Cost with

CAMERON PRODUCTS

Successful and profitable operation depends largely on maintenance. Length of life and service should be the prime factors when purchasing renewal parts and other material entering into maintenance.

Cameron products are made to meet the requirements of the industry—and they do it.

Cameron Magnet and Field Coils—Wound to withstand that rush-hour overload that means a burnout with poorly insulated coils.

Cameron Bars—Pure hard drawn copper, giving high conductivity.

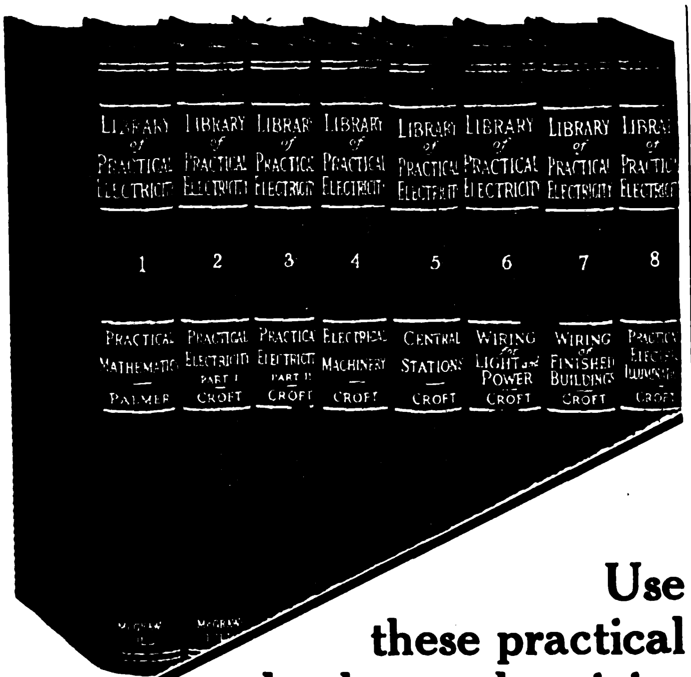
Cameron Commutators—made tight by hydraulic pressure, eliminating loose bars and arcing brushes. Specializing also in commutators for starting and lighting for automobiles, trucks and buses.

Canadian Amber—Gives soft, uniform wear and long life.

Try Cameron Products—watch their performance and incidentally watch maintenance cost go down.

Quality products turned out by Yankee mechanics, who know, is what you get when you buy from us.

CAMERON
Electrical Mfg. Co., Ansonia, Conn.


Library of Practical Electricity 1 Practical Mathematics Palmer
Library of Practical Electricity 2 Practical Electricity Part I Croft
Library of Practical Electricity 3 Practical Electricity Part II Croft
Library of Practical Electricity 4 Electrical Machinery Croft
Library of Practical Electricity 5 Central Stations Croft
Library of Practical Electricity 6 Wiring of Light and Power Croft
Library of Practical Electricity 7 Wiring of Finished Buildings Croft
Library of Practical Electricity 8 Practical Electric Illumination Croft

Use these practical books on electricity for 10 days *FREE!*

YOU will never know how easy it is to master electricity until you see the LIBRARY OF PRACTICAL ELECTRICITY, by Terrell Croft.

And you will never know how much a knowledge of electricity means to you in dollars and cents until you gain this knowledge.

The man who knows the most about his work is the man who gets the most in his pay envelope. Croft will teach you as he has taught 40,000 others—teach you by a new, revolutionizing method that saves you time, effort and money. He will teach you electricity as practiced by experts and qualify you for an expert's pay.

The Croft Library

A combined reference library and home study Course in practical electricity

Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, currents, switchboards, distribution systems—electrical machinery of every type, its installation, operation and repair—wiring for light and power—how to do it mechanically perfect, in accordance with the National Electrical Code—wiring of finished buildings—underwriters' and municipal requirements—how to do a complete job, from estimating it, to completion—illumination in its every phase—the latest and most improved methods of lighting—lamps and lighting effects, etc.

Free examination—no money down—only $1.50 in ten days and $2.00 a month until paid

Fill in and mail the coupon attached and we will send you the entire set of eight volumes for ten days' Free Examination. We take all the risk—pay all charges. You assume no obligation—you pay nothing unless you decide to keep the books. Then $1.50 in ten days and the balance at the rate of $2.00 a month. Send the coupon NOW and see the books for yourself!

Free Examination Coupon

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

Gentlemen:—Please send me the **Croft Library of Practical Electricity** (shipping charges prepaid) for 10 days' free examination. If satisfactory, I will send $1.50 in ten days and $2.00 a month until the special price of $19.50 has been paid. If not wanted I will write you for return shipping instructions. (Write plainly and fill in all lines.)

Name ....

Home Address..

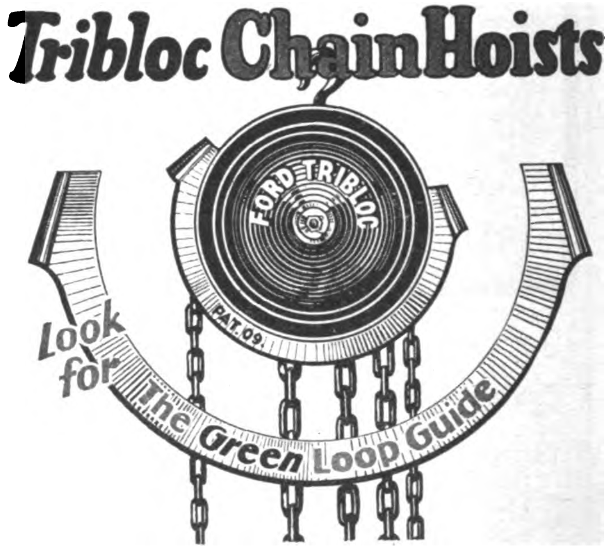
City and State..

Employed by..

Occupation .... E. R. J. 3-22-24

FORD

Tribloc Chain Hoists

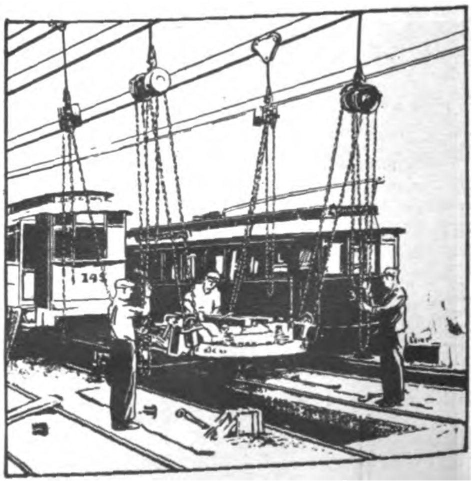

FORD TRIBLOC
PAT. 09.
Look for The Green Loop Guide

THE *Green* Loop Guide is the mark of a good chain hoist. Good because of the high efficiency of its planetary gearing; because of its Patented Loop Hand Chain Guide which protects the hoist and controls the hand chain at all speeds of travel; because of its rugged construction throughout.

Ford Triblocs have 80% efficiency; an eighty-pound pull of one man on the hand chain of a 1-Ton Tribloc will lift a ton. Strong and compact. Made entirely of malleable iron and steel, except the Hand Chain Wheel, which is gray iron. Capacities from ¼ to 20 tons.

Write for Catalog 6B

FORD CHAIN BLOCK COMPANY
2nd and Diamond Sts., Philadelphia, Pa.
Overseas Representative: Allied Machinery Co. of America
90 Wall St., New York, N. Y.



Paint With DIXON'S

Inside and Out

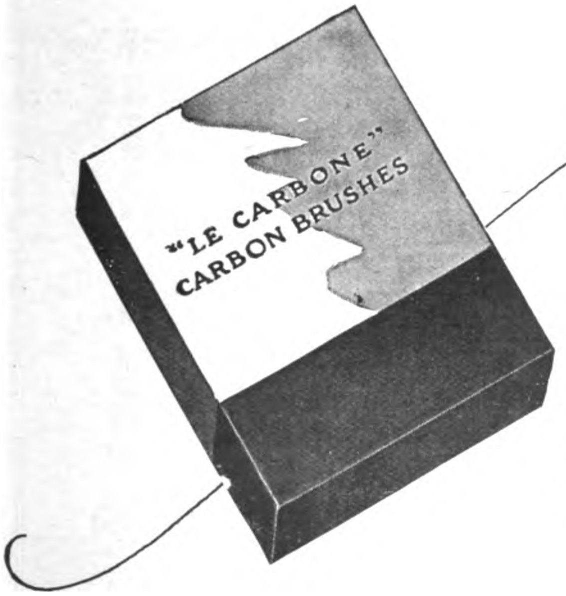
Managers in all parts of the world answer the vexatious paint question in this way. They *know* that DIXON'S has produced for them the lowest yearly cost for paint protection, and are not inclined to experiment with "cheaper per gallon" short-lived paints.

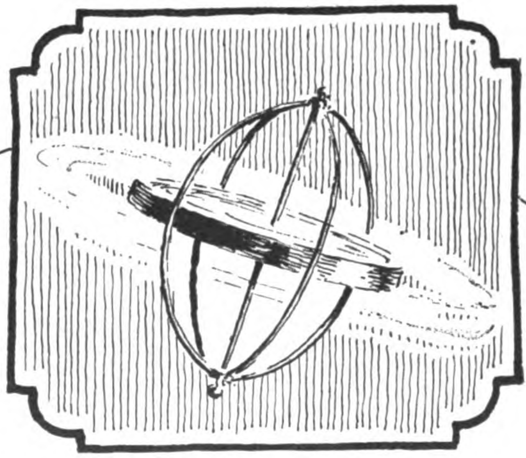
DIXON'S
Silica-Graphite
PAINT

defies the action of climate and wear—is not subject to attack by acids, alkalies or fumes. Nature's mixture of flake graphite and silica embodying the properties necessary to complete protection under all kinds of service conditions.

Write for Booklet No. 180-B.

JOSEPH DIXON CRUCIBLE COMPANY
Jersey City, New Jersey
Established 1827





Uniformity

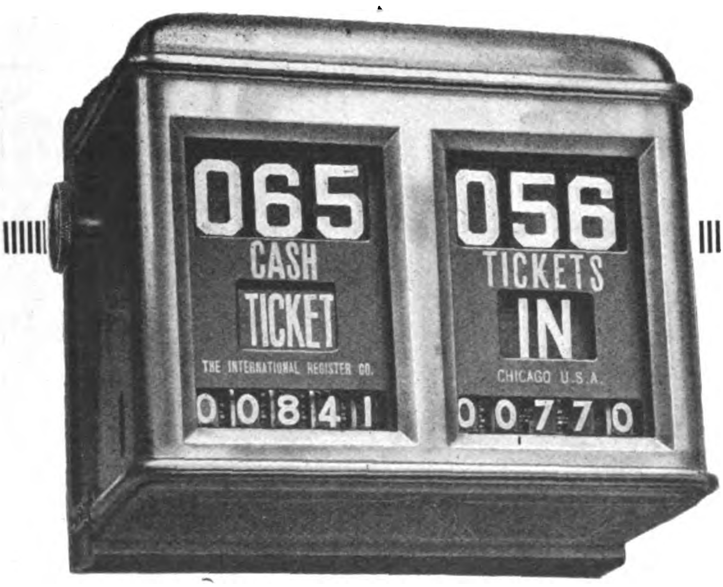
meaning most car-miles per brush dollar

Le Carbone
Carbon
Brushes

W. J. Jeandron, 345 Madison Avenue, New York

Pittsburgh Office: 634 Wabash Bldg. **San Francisco Office:** 525 Market Street **Chicago Office:** 1657 Monadnock Block

Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto



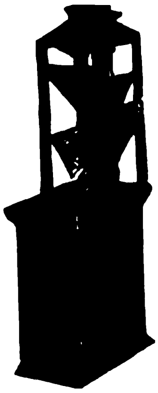
International Fare Registers

A COMPLETELY satisfactory fare registration system is one that has the confidence of the public, the conductor, and of the accounting department. The simplicity and accuracy of International Registers maintained for more than thirty years, is combined in the later types with the extra speed and convenience of electric operation.

Our latest types of registers, both the R-10 Single Register and the R-11 Double Register are arranged for hand or foot operation or for electric operation.

Exclusive Selling Agents
for HEEREN Enamel Badges

The International Register Company
15 South Throop St., Chicago



They Always Fit the Fare and Fare Collection System

Cleveland Fare Boxes
PLUS
Supervision OF THEIR USE
EQUALS
100% Fare Collection.

Given the details of the "CLEVELAND" and our Fare Collection Plan, you at once realize that Fare Collection losses are preventable if the Fare Boxes, and their use, are given proper supervision.

Fare Collection Supervision, that insures all the fares reaching the treasury, is less costly under the "CLEVELAND" and further, there is no chance for hidden "leaks"—any manipulation always leaves the evidence behind. Accommodates any rate of cash fare, any kind of ticket.

THE CLEVELAND FARE BOX CO.,
4900 Lexington Avenue, CLEVELAND, OHIO
Canadian Cleveland Fare Box Co., Ltd., Preston, Ont.
Fare Boxes, Coin Counting and Sorting Machines, Change Carriers

Make Lasting Repairs

Awebco
TRADE MARK

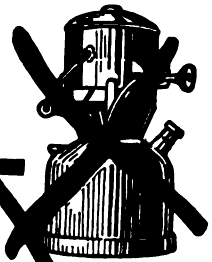
Electrical Tapes and Webbings

REPAIRS and replacements made with Awebco tapes and Webbings are lasting repairs.

Each tape or webbing is the product of long experience in manufacture and expert knowledge of the uses for which it will be required. Insulation value is a fixed factor.

Sample cards and information on request

ANCHOR WEBBING CO., Pawtucket, R. I.

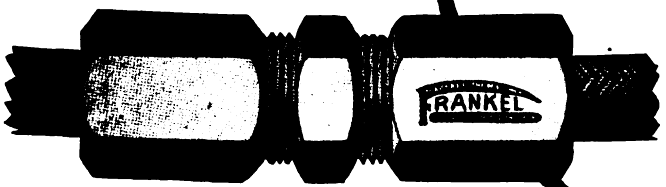


Discard—The Solder Pot—

Promoting Greater Efficiency

FRANKEL SOLDERLESS CONNECTORS eliminate the many wasteful and unsatisfactory methods of making cable splices, and make a joint that will give any desired electrical and mechanical service.

Use



—DISTRIBUTORS—

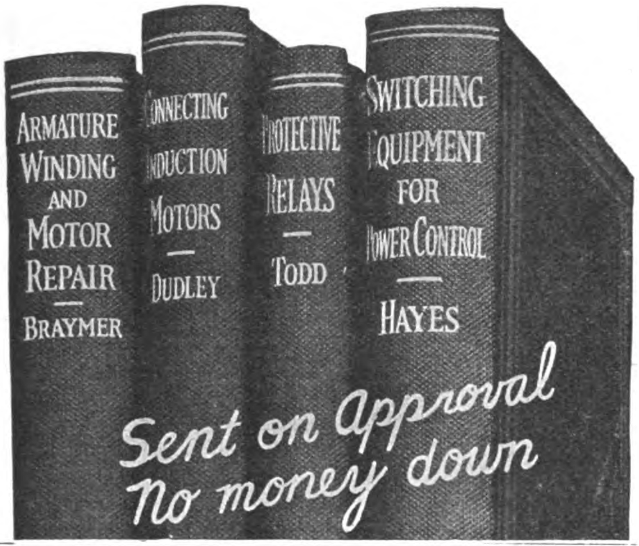
Westinghouse Elec. & Mfg. Co.

Sales Offices in all Principal Cities

Western Electric Company

Four Best Books

on Practical Electricity for Railway Shop Men


ARMATURE WINDING AND MOTOR REPAIR — BRAYMER
CONNECTING INDUCTION MOTORS — DUDLEY
PROTECTIVE RELAYS — TODD
SWITCHING EQUIPMENT FOR POWER CONTROL — HAYES
Sent on approval
No money down

Examine Any or All

For 10 Days FREE

Just send the coupon back. See any of these books—or all. Use them in your work—make them prove their value. No charge—just the coupon.

Braymer's
ARMATURE WINDING AND MOTOR REPAIR, $3.00

A common-sense, practical book. Shows you at a glance where to begin, what type of winding to use, and the best way to do it. Crammed full of practical kinks and suggestions on all kinds of motor repair work.

Dudley's
CONNECTING INDUCTION MOTORS, $2.50

How to connect an induction motor winding to meet any condition of voltage, phase, frequency, and speed, and how to check this re-connection to know if the motor will operate under the new condition. Plenty of diagrams included.

Todd's
PROTECTIVE RELAYS, $2.50

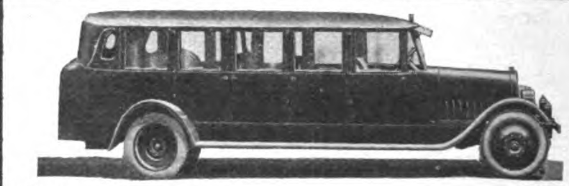
Shows how to protect apparatus such as generators, motors, transformers and lines from actual damage due to disturbances and abnormal conditions. Shows how to sectionalize instantly defective lines and how to isolate defective units and still permit continuance of service.

Hayes'
SWITCHING EQUIPMENT FOR POWER CONTROL, $4.00

How to care for, repair and operate switchboards and switching equipment. Takes up also the selection and installation of such equipment. Many valuable illustrations and diagrams.

Free Examination Coupon

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York.
You may send me on 10 days' approval—
......Braymer's Armature Winding and Motor Repair, $3.00.
......Dudley's Connecting Induction Motors, $2.50.
......Todd's Protective Relays, $2.50.
......Hayes' Switching Equipment for Power Control, $4.00.
I agree to pay for the books or return them postpaid within 10 days of receipt.
Subs. Electric Railway Journal? ....
Signed ....
(Please Print)
Address ....
Official Position ....
Name of Company ....
(Books sent on approval to retail purchasers in U. S. and Canada only.)
E 3-22-24



H-W Bus seat comfort keeps step with Touring Bus development

Tourease No. 8C5

Elec. Ry. Seat

Driver's Seat

Steam R. R. Seat

The H-W "Tourease" A Bus-seat Sensation

In the design and construction of the new H-W "Tourease," ninety-eight years of seat-building experience has been centered. Here is a real bus-seat achievement.

Backs are either 19 or 22 inches high, designed to allow ample knee room *without sacrifice of spring depth.* Cushions are extra wide and deep, of double spring construction — "comfy" springs over wire-top spring work. As easy as an overstuffed chair. The one-piece frames are unusually sturdy. Pedestal ends have wide-flanged floor castings with double supporting arms welded to full length pressed steel cushion and back supports.

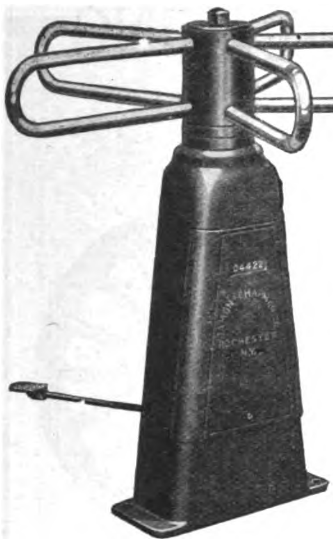
Whether or not your "length of haul" demands these extremes of passenger comfort, the complete H-W line is certain to contain the seat best suited to your needs. Freely consult our passenger-seating experts on your particular requirements.

HEYWOOD-WAKEFIELD COMPANY

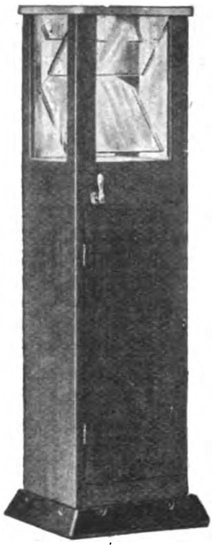
HEYWOOD-WAKEFIELD CO.
1415 So. Michigan Ave., Chicago, Ill.
HEYWOOD-WAKEFIELD CO.
516 W. 34th St., New York
E. F. BOYLE
Monadnock Bldg., San Francisco
F. N. GRIGG
630 Louisiana Ave., Washington, D. C.
THE G. F. COTTER SUPPLY CO.
Houston, Tex.
THE RAILWAY AND POWER ENGINEERING CORP'N
Montreal and Toronto, Canada

Heywood-Wakefield
REG. U.S. PAT. OFF.

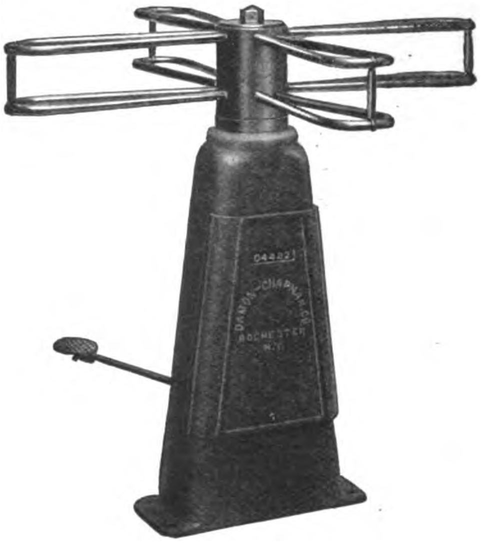
Five-Arm Turnstile



Ticket Box



Four-Arm Turnstile



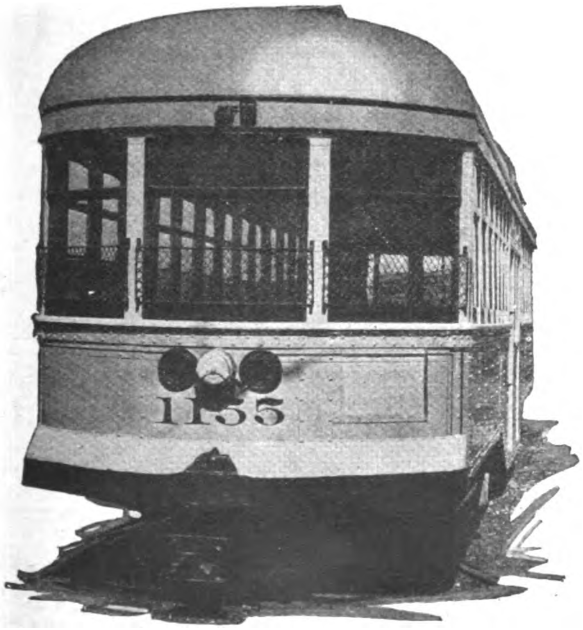
YOU CAN SEE OUR

TURNSTILES AND TICKET BOXES

Thruout the BOSTON L., in the new HARLEM STATION of the N. Y., WESTCHESTER, in the DIXIE TERMINAL at Cincinnati, in the BALTIMORE PARKS, in the new THOMPSON PARK at Rockaway, in WILLOW GROVE of Philadelphia, in SUNNYSIDE at Toronto and in many other prominent places.

DAMON-CHAPMAN CO.

234 MILL STREET **ROCHESTER, N. Y.**



Protect Your Rolling Stock! Keep Down Accident Costs! With N-L Indicating Signals!

The profitable trips are those made on schedule time. Speed up your profits by cutting down costly delays.

Minimize the danger of rear-end collisions and you lessen the possibilities of interrupted service. Smashups of this kind will diminish in exactly the ratio in which you make it possible for the motorman ahead to signal instantly to the motorman behind—and to the trailing truck and pleasure-car drivers.

Write today for complete information on N-L Indicating Signals and Stop Lights.

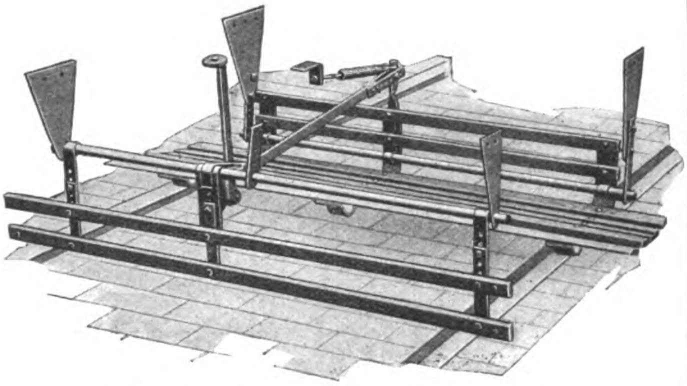
The Nichols-Lintern Company, 7960 Lorain Avenue, Cleveland, Ohio

N-L Products Manufactured and Sold in Canada by Railway & Power Engineering Corporation, Ltd., 133 Eastern Avenue, Toronto, Ontario.

ROOT

all-spring-steel

Life Guards



Important Features

Safety and Low Maintenance

The Root All-Spring-Steel Life Guard is a real *life guard*. It *works*—instantly and unfailingly. It is different, and, we believe, better than any other guard on the market—different in principle, and strongly, staunchly built to withstand the shocks.

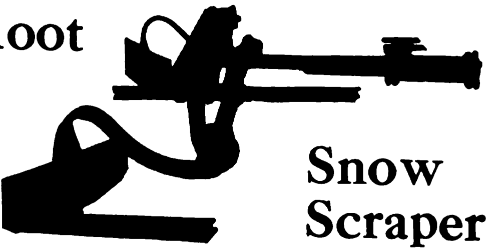
The Root All-Spring-Steel Life Guard cannot rattle down by the oscillation of the car. A heavy coiled spring, when an object strikes the gate, springs the basket firmly to the pavement so that no object can get under or through. We want you to specify this guard on your cars.

A first-class made, and working machine, indorsed by the New York Public Utility Commission.

A Sample Sent on Approval

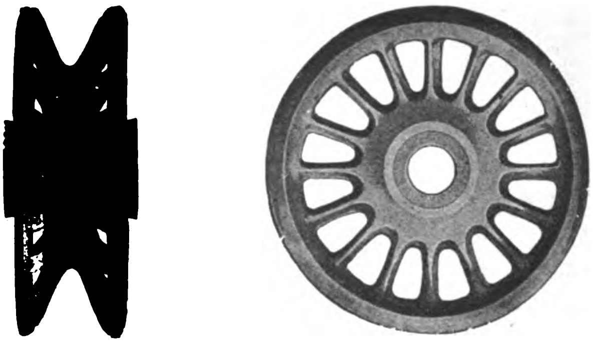
Root Spring Scraper Co.
Kalamazoo, Mich.

Root



Snow Scraper

SLEET CUTTING DEVICES



Nuttall Sleet Wheels replace the standard trolley wheels and efficiently clean sleet coated wires.

Nuttall Sleet Scrapers hook over the trolley wheel—can be attached instantly, and clean the wire thoroughly. Don't wait for a sleet storm—order *today*.

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

This Paper is a "Member *of the* A.B.P."

To you, this is a fact of especial significance, for it means that this publication is part of a concerted movement to raise the level of publishing practice, to assure better service to both subscribers and advertisers.

The "A.B.P." is built upon and revolves around the following set of standards—

STANDARDS *of* PRACTICE

THE publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

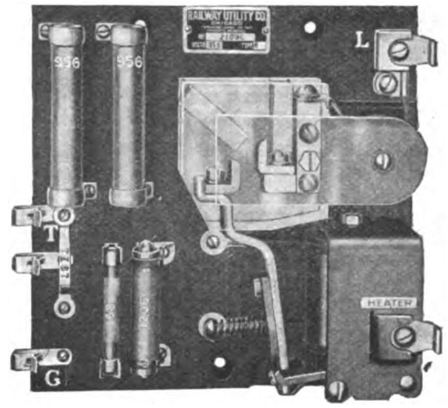
1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation statements, subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Publications which have subscribed to these standards have earned the preferred consideration accorded them.

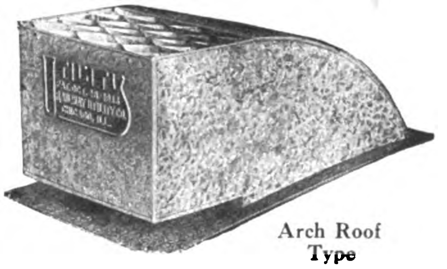
THE ASSOCIATED
BUSINESS PAPERS, INC.
220 West 42nd St., New York

UTILITY PRODUCTS

100% Efficient



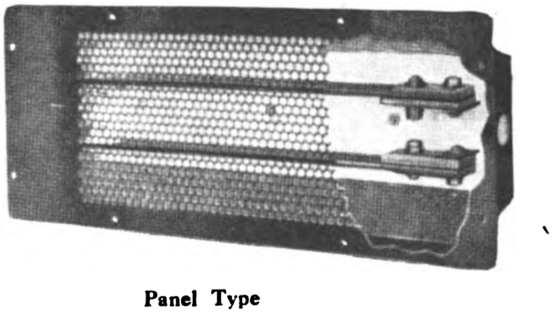
Utility New Type No. 8 Heat Regulator
—without a Relay—Ask us about it.



Utility Honeycomb Ventilator

Designed for Monitor Deck or Arch Roof Cars.

In use on more than 24,000 Steam and Electric Railway Cars.



Panel Type

Utility Electric Heaters

for street and interurban electric railway cars are designed and built to give full service under the most severe conditions over long periods of use.

Railway Utility Company
Chicago

J. H. Denton, 1328 Broadway, New York
E. S. McNamara 307 Barth Bldg., Denver
Detroit Railway Supply Co.,
401 Equity Bldg., Detroit

AMERICAN ELECTRICAL WORKS AMELECTRIC Wires and Cables PHILLIPSDALE, R.I.

Reg. U. S. Pat. Office

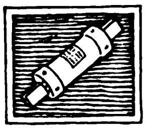
Incandescent Lamp Cord

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

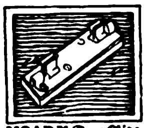
AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.

Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

J-P Products of interest to Electric Railways

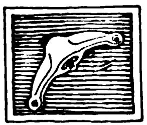


NOARK Fuses

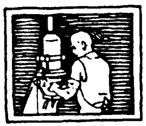


NOARK Fuse Clips CUTOUT BASES

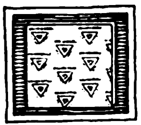
NOARK Service and Underground Boxes



Railway and Mine hangers and insulators



J-P Molding Service [Control Bars]



VULCABESTON Sheet and Rope Packing

JOHNS-PRATT CO. HARTFORD, CONN.

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE CONSTRUCTION

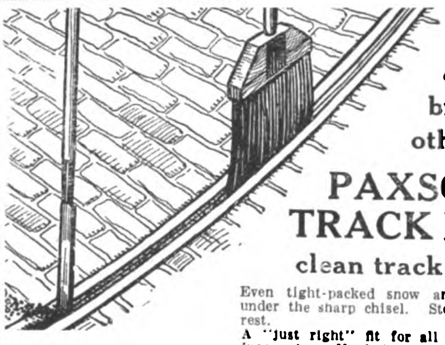
New York Switch & Crossing Co.
Hoboken, N. J.

Lorain Special Trackwork
Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.



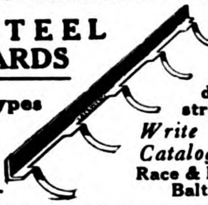
Steel chisel on one end—broom on the other.

PAXSON TRACK BROOMS
clean track in a jiffy

Even tight-packed snow and ice soon breaks up under the sharp chisel. Stout steel bristles do the rest.
A "just right" fit for all trackwork, frogs, crossings, etc. Used by leading properties for over 25 years. Send for a sample—you'll be *pleased.*

J. W. PAXSON CO.
Manufacturers
Nicetown Lane and D St., Philadelphia, Pa.

METAL SAFETY CROSS TIES
Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.
REVOLUTIONIZES ROADBEDS
Write for descriptive folder and quotation.
METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.



GODWIN STEEL PAVING GUARDS
Adapted to all types of rails and paving.
W. S. GODWIN CO., Inc.

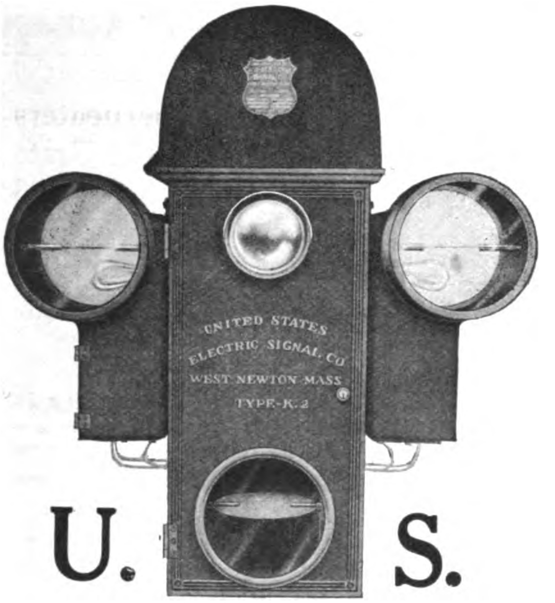
Proven by service to economically prevent seepage and disintegration of street railway paving.
Write for Illustrated Catalog No. 20.
Race & McComas Sts., Baltimore, Md.

Shaw Lightning Arresters
Standard in the Electric Industries for 35 years
Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

Standard Underground Cable Co.
Boston Philadelphia Pittsburgh Detroit
New York Washington Chicago St. Louis San Francisco

ROEBLING
INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

Chapman
Automatic Signals
Charles N. Wood Co., Boston



U. S.

ELECTRIC SIGNALS

Type K-2 includes every known safeguard

Double-stop indications—red light for night and big disc for daytime, both operating simultaneously making observation certain in daylight, twilight, or the darkest night. Duplicate lamps cut-in automatically in case one set burns out.

UNITED STATES ELECTRIC SIGNAL CO.
WEST NEWTON, MASS.

REPRESENTATIVES:
Western: Frank F. Bodler, Monadnock Bldg., San Francisco, Calif.
Foreign: Forest City Electric Service Supply Co., Manchester, England.

Live
CHESTNUT
Poles

Cut from Unblighted Trees

Special prices on 30 ft., 35 ft., and 40 ft. Lengths

Cook Pole & Tie Company
Commercial Trust Building
PHILADELPHIA, PA.

Large Dealers in Ties and Switch Timbers

Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000. Wet 31,400. Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1848—Inc. 1870

The Baker
Wood Preserving Company
CREOSOTERS
Washington Court House, Ohio

Cross Ties Bridge Timbers
Lumber Posts
Piling

Treated and Untreated

We solicit your inquiries

Creosoting Plant located
Washington Court House, Ohio
On—Penna. R.R., B. & O. R.R., D. T. & I. R.R.
Operating Mills in Southern Ohio

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

BRANCH OFFICES

Boston, 49 Federal Street
Philadelphia, North American Building
Pittsburgh, Farmers Deposit Bank Building
Cleveland, Guardian Building
Chicago, Marquette Building
Cincinnati, Traction Building
Atlanta, Candler Building
Tucson, Ariz., 21 So. Stone Avenue
Dallas, Tex., 2001 Magnolia Building
Honolulu, H. T., Castle & Cooke Building
Portland, Ore., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES

Detroit, Ford Building
New Orleans, 521-5 Baronne Street
Houston, Texas, Southern Pacific Building
Denver, 435 Seventeenth Street
Salt Lake City, 705-6 Kearns Building
San Francisco, Sheldon Building
Los Angeles, 404-6 Central Building
Seattle, L. C. Smith Building
Havana, Cuba, Calle de Aguiar 104
San Juan, Porto Rico, Royal Bank Building

P.T.L. INSPECTORS

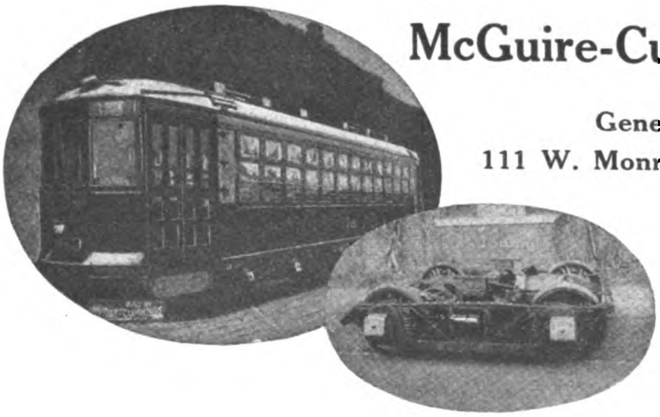
are permanently located in all the large production centers and can, therefore, make accurate progressive inspection and tests of all items prior to delivery as well as during assembly at the car building plant.

Our bulletin No. 28 gives complete information on this phase of P.T.L. Service

PITTSBURGH TESTING LABORATORY
Inspection Engineers and Chemists

Pittsburgh, Penna. New York, 30 Church St.

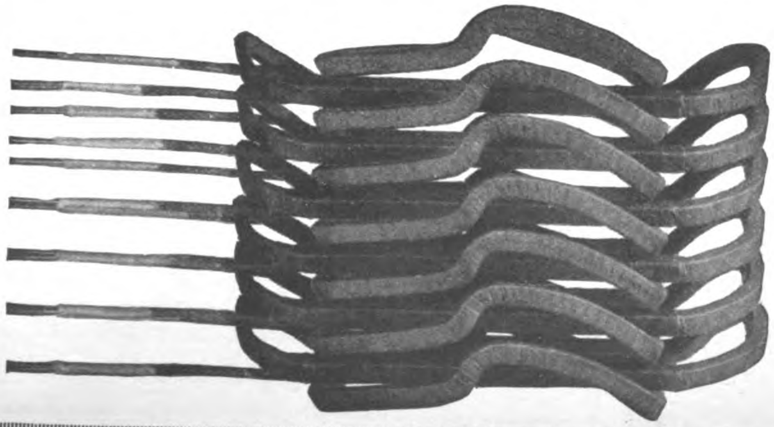
Branch Offices in:
Chicago, Cleveland, Cincinnati, Little Rock, Philadelphia, Detroit, St. Louis, Birmingham, Raleigh, Buffalo, Dallas



McGuire-Cummings Manufacturing Co.

General Offices:
111 W. Monroe St., Chicago, Ill.

Street Cars
Trucks
Snow Sweepers



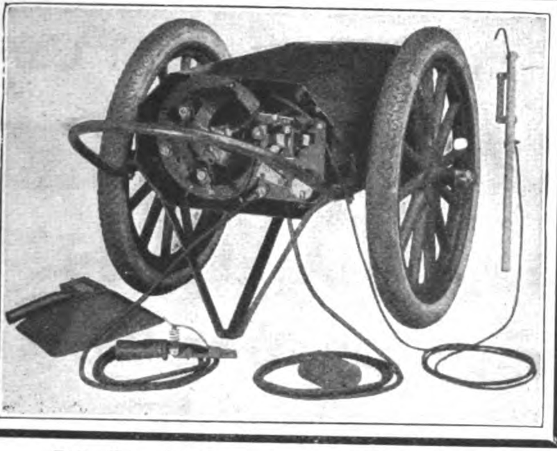
Motor Overhaul Is Expensive

Your replacement coils should be absolutely dependable.

More than thirty years experience in the production of armature and field coils for railway motors has qualified us to give you coils which will stand up in the most severe service. They are made in a shop specializing on this work alone. Every job receives the constant supervision of a manager who has made coils ever since the days of coil-wound armatures.

Let us quote you our prices

Elliott-Thompson Electric Co.
Ajax Building, Cleveland, Ohio



Light—Handy—Reliable
Here's Why:—

1 The **Liteweld** Track Bonder and Welder takes less line current to operate than any other welder of equal welding power.

2 It does not disturb the line voltage when welding.

3 The operator cannot spoil the work by holding a long arc.

4 Arc is easy to maintain, even when welding in a corner or overhead.

5 The **Liteweld** gives a good even deposit of metal **right from the start.**

6 Small weight and size, because new design permits twice the output per lb. of active material in the machine.

LITEWELD CO.

2336 Woodland Ave. Cleveland, Ohio

Prove It—
on 30 Days' Free Trial

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new
Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

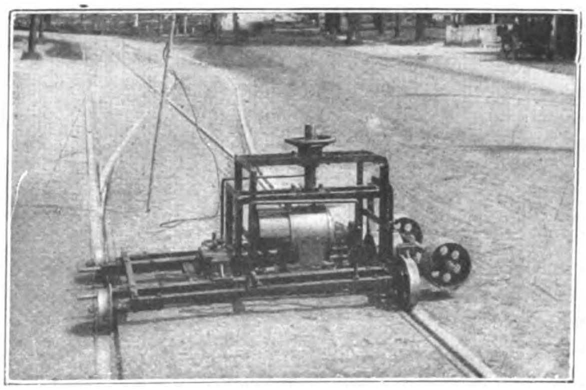
USG

CARBON BRUSHES
for
INTERURBAN
or
STREET CAR SERVICE

Every Brush Fully Guaranteed

Write today for Catalog B-3

The United States Graphite Company
Saginaw, Michigan
District Offices:
New York Pittsburgh Chicago Denver
Philadelphia St. Louis San Francisco



"MIDGET"

Inexpensive but complete!

In this machine, you get a rail grinder that will handle any kind of track grinding jobs and do it quickly and well. *Grinds surface, side or groove in rails, and smooths out corrugations.*

Can be used efficiently between cars on short headway because it's light and extremely easy to handle.

Our new illustrated circular tells the whole story. Send for it.

E. P. Seymour Rail Grinder Co.
Waltham, Mass.

IDEAL FACE SHIELD

Helps to cut maintenance costs because it helps the welder to do a better job, faster.

A necessity,—not a luxury!

Replace old-fashioned, stifling hoods and clumsy masks, with this up-to-date Ideal Face Shield—an essential part of the welder's equipment.

The Ideal Face Shield is light but durable, made of aluminum and vulcanized fibre. Glass can be removed for cleaning without tools.

The Ideal Face Shield Company
468 N. Garfield Avenue, Columbus, Ohio

For Every Type of Car

An Approved Non-Metallic Flexible Tubing-Conduit

Gives best mechanical protection to the insulation on electric wires due to its staunch construction.

ALPHADUCT COMPANY
136 Cator Ave., Jersey City, N. J.

OHMER FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

We Will Build This Attractive PAGODA FREE

***for your* Amusement Park**

This handsome Pagoda root beer stand will be a big addition to your amusement park.

We will build this Pagoda in your amusement park, equip it fully with a Richardson Root Beer Barrel. It won't cost you anything—the concession privileges actually will pay you money.

Send for our proposition now. There's time to have the pagoda all ready for this season.

Walker Amusement Co.
Rochester, N. Y.

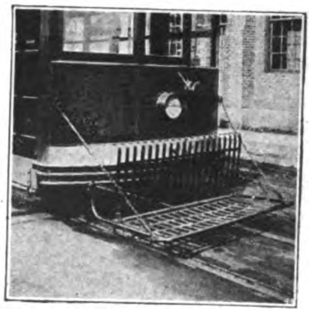
Griffin Wheel Company
McCormick Building
Chicago, Ill.

GRIFFIN
F. C. S.
WHEELS

For Street and Interurban Railways

FOUNDRIES:

Chicago Boston St. Paul
Detroit Kansas City Los Angeles
Denver Council Bluffs Tacoma



Manufacturers of fenders of various types to meet operating conditions. Also Trolley Retrievers and Trolley Catchers of merit and low cost.

Get our prices when in market for such equipment.
Trial samples shipped at our expense upon application.

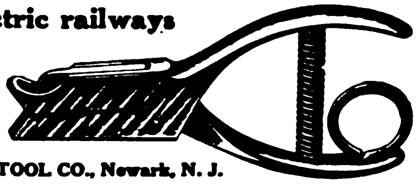
The Eclipse Railway Supply Co.
4824 Payne Ave., Cleveland, O.

Advertisements for the
Searchlight Section
Can be received at the New York Office of Electric Railway Journal until 10 a. m.
Wednesday
For issue out Saturday
0220

TULC
A LUBRICANT

We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC on your equipment
The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

75% of the electric railways use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.



100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

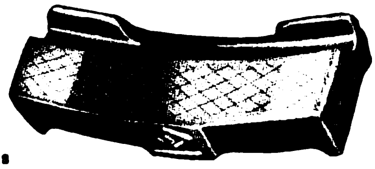
Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

Brake Shoes
A.E.R.A. Standards
Diamond "S" Steel Back is the Best Type

Standard Patterns
for

SAFETY CAR



D-67 for Narrow Treads
D-87 for Wide Treads

American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE

BUCKEYE JACKS
high-grade R. R. Track and Car Jacks
The Buckeye Jack Mfg. Co.
Alliance, Ohio

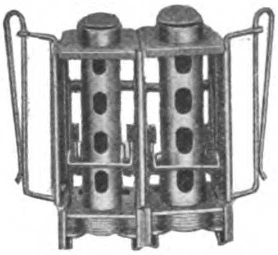
"Opportunity" Advertising:
Think *"SEARCHLIGHT"* First!
0096

B. A. HEGEMAN, Jr., President C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.
Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York
BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

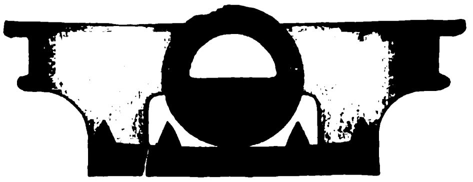
Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

ALLIS-CHALMERS
MILWAUKEE, WIS. U.S.A.
Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

OXYGEN
FOR CUTTING, WELDING, ETC.
INTERNATIONAL OXYGEN COMPANY
NEWARK NEW YORK PITTSBURGH TOLEDO

Car Heating and Ventilation
are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.
The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.



STUCKI SIDE BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.

SEARCHLIGHT SECTION

POSITIONS VACANT

WANTED: Foreman for welding shop, experienced in gas and electrical welding in a Middle West town. In application give references and salary expected. P-670, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

WANTED general track foreman to have charge of four or five gangs on construction and general track maintenance work in Connecticut. State qualifications and give references. P-671, Electric Railway Journal, 10th Ave. at 36th St., New York.

POSITIONS WANTED

AS CLAIM agent, or commerce attorney, age 38, married, Yale graduate in law, now employed, and have been for past five years, with short line, interstate road; specially qualified in Federal and State laws pertaining to railways in practice before the I. C. C. and State Commissions, as well as in the adjustment of claims. PW-661, Electric Railway Journal, 10th Ave. at 36th St., New York.

AS supervisor of welding, bonding and grinding; four years' experience as travelling demonstrator of joint welding, shop welding, bonding, etc; two years' experience in all-around welding on a small road; have practical knowledge of track construction and repair; can guarantee supervision resulting in more efficiency, economy and a broader field of operation for all apparatus. Available about May 15. PW-663, Electric Railway Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT of transportation at present with large successful property that has been placed on sound basis largely through efforts of advertiser, solicits correspondence with managers of city, suburban and interurban properties that require a capable progressive superintendent; 19 years' experience under high-grade executives on large properties; quick to locate leaks and correct same; fully competent to take over all details and build up an organization that would be a credit to any property. Successful in dealing with public and labor in a manner that will get results; will consider any good size property that requires extra effort to get results. Best of references. Personal reasons for desiring a change. PW-664, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

WANTED to locate with city or interurban railway in equipment, distribution, purchasing, construction, traffic and transportation or other capacity requiring engineering ability. Over ten years' experience in railway and power manufacturing, installation, operating. Your proposition solicited. PW-651, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

WANTED: Position as roadmaster and superintendent of overhead and maintenance ways; practical man on special work, welding, bonding and street paving. PW-667, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

When you need new or relaying rails, come to headquarters and get just what you want, in any quantity, and get them quick.

We always have a big stock of rails, from 12 lbs. to 100 lbs. per yard, for immediate delivery. Every rail inspected and guaranteed. Complete with the necessary angle bars.

When it comes to price we are also headquarters—we have complete stocks of new and relaying rails of all weights available for prompt shipment located in thirty convenient distributing points throughout the United States, Canada and Cuba—which in turn means we can make immediate shipments at unbeatable prices to our customers. "Tons of Rails Right at Your Door." Write, 'phone or wire us your requirements.

HYMAN-MICHAELS COMPANY
"The House of Dependable Service"
122 South Michigan Avenue, Chicago
Dealers in New and Relaying Rails, Locomotives and Railway Equipment

District Offices: New York, Woolworth Bldg.; St. Louis, Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.; Detroit, Book Bldg.; San Francisco, 234 Steuart St.
Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa., San Francisco. **Cable Address:** "Hymanmikel"
World's Largest Distributors of Rails

RAILS WANTED

235 tons, 6-in. High T or Shanghai.
72 lb. to 95 lb. per yd.
State Price, Condition, Location.

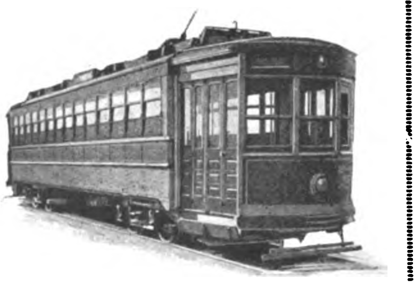
W-669, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

WANTED

6—One Man, Single Truck Safety Cars.
Double End Operation.

W-668, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

FOR SALE



20 ALL STEEL CARS

Length over bumpers	50 ft.	10	in.
Length over corner posts	36 ft.	6	in.
Width over all	8 ft.	7	in.
Height over all	11 ft.	7½	in.

Cars are complete and ready for operation including WH air brakes. Seat 52 people.

TRUCKS

Standard 050 4 ft., 10-in. wheel base.

ELECTRICAL EQUIPMENT

Consists of 4 WH-514 motors and K35 controllers for double end operation.

Code "Cun"

Transit Equipment Company
Cars—Motors
501 Fifth Avenue, New York.

FOR SALE

ROTARY CONVERTERS

for railway use

All sizes—in both 25 and 60 cycles.

ARCHER & BALDWIN, INC.
114-118 Liberty St., New York City
Telephone: Rector 4337-4338

FOR SALE

50—G. E. No. 80-A Motors.
50—Controllers, K-28-B; K-12.
35—B-2 Compressors.

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Circuit Breakers
Roller-Smith Co.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Ammeters
Roller-Smith Co.

Amusement Park Equipt.
Walker Amusement Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
St. Louis Car Co.
Standard Steel Works Co.
Westinghouse E. & M. Co.

Axles (Bus & Trailer)
Timken-Detroit Axle Co.

Axles (front & rear), Motor Truck & Passenger Car
Timken-Detroit Axle Co.

Babbitt Metal
Ajax Metal Co.

Babbitting Devices
Columbia Machine Works & M. I. Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co., The

Barges, Steel
American Bridge Co.

Batteries, Dry
National Carbon Co.

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
Brill Co., J. G., The
Columbia Machine Works & M. I. Co.
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G
Columbia Machine Works & M. I. Co.
Consolidated Car Heati'g Co.
Elec. Service Supplies Co.
St. Louis Car Co
Western Electric Co.

Bodies, Bus
Paterson Vehicle Co.

Boiler Tubes
Edgemoor Iron Co.

Boilers
Babcock & Wilcox Co.
Edgemoor Iron Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Indianapolis Switch & Frog Co.
Lateweld Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
Western Electric Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Indianapolis Switch & Frog Co.
Ohio Brass Co.
Page Steel & Wire Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
Western Electric Co.
Westinghouse E. & M. Co.

Bond Testers
Roller-Smith Co.

Book Publishers
McGraw-Hill Book Co., Inc.

Boxes, Junction & Outlet
National Metal Molding Co.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
Bates Exp. Steel Truss Co.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
Western Electric Co.

Brake Adjusters
Brill Co., The J. G.
National Ry. Appliance Co
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia Machine Works & M. I. Co.
General Electric Co.
Johns-Manville, Inc.
National Brake Co.
St. Louis Car Co.
Safety Car Devices Co.
Westinghouse Tr. Br. Co.

Bridges & Buildings
American Bridge Co.

Brooms, Tracks, Steel or Rattan
Paxson Co., J. W.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
National Carbon Co.
Stackpole Carbon Co.
U. S. Graphite Co.
Westinghouse E. & M. Co.

Brushes, Graphite
National Carbon Co.
U. S. Graphite Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Buses, Motor
Brill Co., The J. G.
Brockway Corp.
N. Y. Transportation Co.
Pierce-Arrow Motor Car Co.
St. Louis Car Co.

Bus Bodies
Paterson Vehicle Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G
National Metal Molding Co.
St. Louis Car Co.

Cables. (See Wires and Cables.)

Cambric Tapes, Yellow and Black Varnish
Irvington Varnish & Ins. Co.
Mica Insulator Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
Brill Co., J. G., The
Differential Steel Car Co.
St. Louis Car Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heati'g Co.
Westinghouse E. & M. Co.

Car Steps, Safety
Irving Iron Works

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Thomas Car Works, Perley A.
Wason Mfg. Co.

Cars, Gas, Rail
Brill Co., J. G., The
St. Louis Car Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

Cars, Self-Propelled
Brill Co., J. G., The
General Electric Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
Columbia Machine Works & M. I. Co.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
Bemis Car Truck Co.
Columbia Machine Works & M. I. Co.
Standard Steel Works Co.
St. Louis Car Co.

Castings, Malleable and Brass
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
Columbia Machine Works & M. I. Co.
St. Louis Car Co.

Castings, Nichrome
Driver-Harris Co.

Catchers and Retrievers, Trolley
Earll, C. I.
Eclipse Ry. Supply Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.
Western Electric Co.

Ceiling, Car
Pantasote Co., Inc.

Ceilings, Plywood Panels
Haskelite Mfg. Co.

Cement Products
Portland Cement Ass'n.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
General Electric Co.
Roller-Smith Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Dossert & Co.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co

Cleaners and Scrapers Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
Root Spring Scraper Co.
St. Louis Car Co.

Cleats
National Metal Molding Co

Cloth, Stencil Silk Signs
Kress & Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.

Coils Armature and Field
Columbia Machine Works & M. I. Co.
Economy Electric Devices Co.
Elliot-Thompson Elec. Co.
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
Intern'l Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
Columbia Machine Works & M. I. Co.
General Electric Co.
Westinghouse E & M. Co.

Compounds, Insulating & Splicing
Johns-Manville, Inc.

Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Western Electric Co.
Westinghouse Tr. Br. Co.

Compressors, Air Portable
Ingersoll-Rand Co.

Concrete Flooring, Surface
Irving Iron Works

Condensor Papers
Irvington Varnish & Ins. Co.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Conduits, Flexible
Alphaduct Co.

Connectors, Solderless
Dossert & Co.
Frankel Connector Co.
Westinghouse E. & M. Co.

Connectors, Trailer Car
Consolidated Car Heat. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Allis-Chalmers Mfg. Co.
Columbia Machine Works & M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
Anaconda Copper Mining Co.
Page Steel & Wire Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Cranes
American Engineering Wks.
Industrial Works
Universal Crane Co.

Cranes, Locomotive, Motor Truck & Portable
Industrial Works
Universal Crane Co.

Cranes, Gasoline or Electric
Industrial Works
Universal Crane Co.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossing, Frog & Switch
Ramapo Ajax Corp.

Crossing, Manganese
Bethlehem Steel Co.
Indianapolis Switch & Frog Co.
Ramapo Ajax Corp.

Crossings
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
Pantasote Co., Inc.
St. Louis Car Co.

Dealer's Machinery
Archer & Baldwin, Inc.
Elec. Equipment Co.
Hyman-Michaels Co.
Transit Equipment Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G
Consolidated Car H't'g Co.
General Electric Co.
Hale-Kilburn Co.
Nat'l Pneumatic Co., Inc.
St. Louis Car Co
Safety Car Devices Co.

Doors & Door Fixtures
Brill Co., The J. G.
Consolidated Car Heati'g Co.
General Electric Co.
Hale-Kilburn Co.
Morton Mfg. Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.
Hetherington & Berner, Inc.

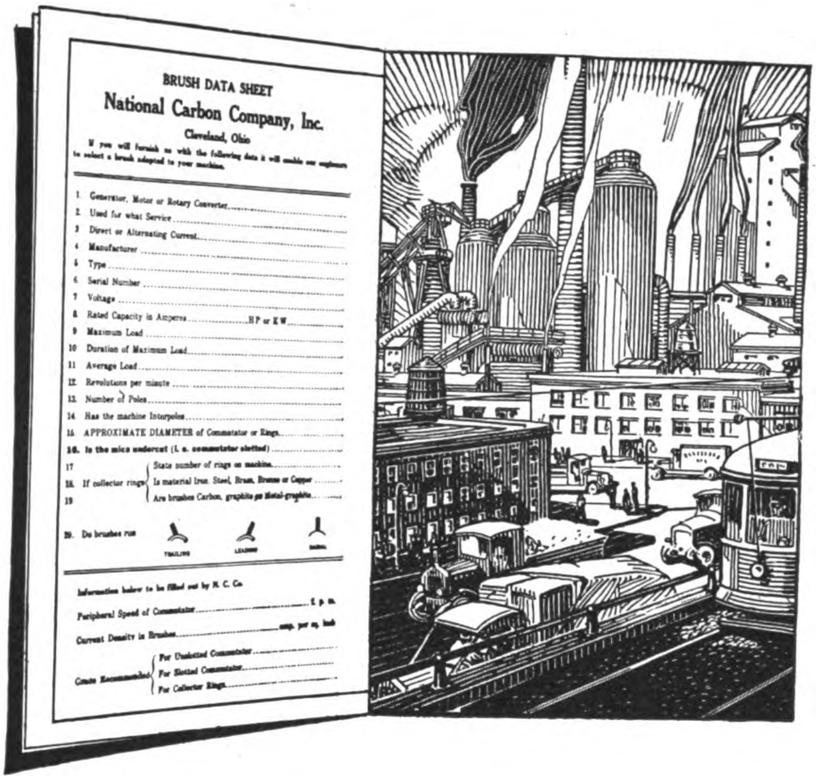
Ears
Ohio Brass Co.

Ebony Asbestos Wood
Johns-Manville, Inc.

Electrical Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Roebling's Sons & Co., J. A.
Western Electric Co.

Electric Furnaces
American Bridge Co.

Electric Grinders
Railway Track-work Co
Seymour Rail Grinder Co., E. P.



BRUSH DATA SHEET
National Carbon Company, Inc.
Cleveland, Ohio

If you will furnish us with the following data it will enable our engineers to select a brush adapted to your machine.

1 Generator, Motor or Rotary Converter
2 Used for what Service
3 Direct or Alternating Current
4 Manufacturer
5 Type
6 Serial Number
7 Voltage
8 Rated Capacity in Amperes .... H P or K W
9 Maximum Load
10 Duration of Maximum Load
11 Average Load
12 Revolutions per minute
13 Number of Poles
14 Has the machine Interpoles
15 APPROXIMATE DIAMETER of Commutator or Rings
16. Is the mica undercut (i. e. commutator slotted)
17 If collector rings { State number of rings on machine
18 Is material Iron, Steel, Brass, Bronze or Copper
19 Are brushes Carbon, graphite or Metal-graphite
20. Do brushes run

Information below to be filled out by N. C. Co.
Peripheral Speed of Commutator .... f. p. m.
Current Density in Brushes .... amp. per sq. inch
Grade Recommended { For Unslotted Commutator
For Slotted Commutator
For Collector Rings

The Gateway to Guaranteed Brush Performance

WHEN you fill out the National Pyramid Brush Data Sheet (one for each machine) you open the door to a new experience—freedom from brush troubles. No more excessive brush or commutator wear; no more expensive tie-ups while new brushes are waited for; no more doubts as to what brushes you need. The Data Sheet puts all these things up to us.

Any superintendent or plant engineer can fill it out so that our engineers can specify the correct brushes for best results.

Thousands of industrial plants and public utilities use this Data Sheet Service because it brought them the right brushes the first time and makes re-ordering simple. They just write—wire—telephone, "Send set of brushes as per Data Sheet No. so-and-so," and the order is correctly filled without delay.

Anyone anywhere can fill out these Data Sheets, or one of our sales engineers will call and do so. A supply of Data Sheets sent free upon request.

NATIONAL CARBON COMPANY, INC.
Cleveland, Ohio San Francisco, Cal.

Canadian National Carbon Co., Limited
Factory and Offices: Toronto, Ontario

Electrodes, Carbon
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Electrodes, Steel
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbins, J. Rowland
Buchanan & Lay Corp.
Byllesby & Co., H. M.
Day & Zimmerman, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Richey, Albert S.
Sanderson & Porter
Sangster & Co., A.
Stevens & Wood
Stone & Webster
White Eng. Corp., The J. G.
Wortham, Edwin

Engineer Inspecting & Chemists
Pittsburgh Testing Lab.

Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Face Shield (Protector)
Ideal Face Shield Co.

Fare Boxes
Cleveland Fare Box Co.
Economy Electric Devices Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.

Fare Registers
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Eclipse Ry. Supply Co.
Elec. Service Supplies Co.
Root Spring Scraper Co.
St. Louis Car Co.

Fibre and Fibre Tubing
Johns-Manville, Inc.
Westinghouse E. & M. Co.

Field Coils (See Coils)

Fire Extinguishers
Johns-Manville, Inc.

Flangeway Guards, Steel
Godwin Co., Inc., W. S.

Floodlights
Elec. Service Supplies Co.

Flooring Composition
Johns-Manville, Inc.

Flooring, Fireproof
Irving Iron Works

Flooring, Non-Slipping
Irving Iron Works

Flooring, Open Steel
Irving Iron Works

Flooring Steel, Subway
Irving Iron Works

Flooring, Ventilating
Irving Iron Works

Forgings
Brill Co., J. G., The
Duff Mfg. Co.
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Fuses and Fuse Boxes
Columbia Machine Works & M. I. Co.
Consolidated Car Heati'g Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.

Fuses, Cartridge, Non-Refillable & High Voltage
Johns-Pratt Co.

Fuses, Refillable
General Electric Co.
Johns-Manville, Inc.
Johns-Pratt Co.

Gaskets
Westinghouse Tr. Br. Co.

Gas Producers
Westinghouse E. & M. Co.

Gasolene Torches
Economy Electric Devices Co.

Gas-Electric Cars
General Elec. Co.
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.
Brill Co., J. G., The
Standard Steel Works Co.

Gear Cases
Chillingworth Mfg. Co.
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Goggles, Protector
Indianapolis Switch & Frog Co.

Gong (See Bells and Gongs)

Grating, Steel Subway
Irving Iron Works

Greases (See Lubricants)

Grinders and Grind. Supplies
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.
Seymour Rail Grinder Co., E. P.

Grinding Bricks and Wheels
Railway Track-work Co.

Ground Wires
Page Steel & Wire Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Ball & Manganese
Ramapo Ajax Corp.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson Mfg. Co., A.&J.M
Elec. Service Supplies Co.
More-Jones Brass Metal Co.
Nuttall Co., R. D.
Star Brass Works

Headlights
Elec. Service Supplies Co
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Headlining
Haskelite Mfg. Co.
Pantasote Co., Inc.

Heaters, Car (Electric)
Consolidated Car Heati'g Co.
Economy Electric Devices Co.
Gold Car Heat. & Ltg. Co.
Nat'l Ry. Appliance Co., P.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Elec. Service Supplies Co.
Smith Heater Co., Peter

Helmets—Welding
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Hoists & Lifts
Columbia Machine Works & M. I. Co.
Ford Chain Block Co.

Hoists, Electric
American Engineering Wks.

Hoists, Portable
Ingersoll-Rand Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating Signals
Oskel Equipment Co.

Industrial Flooring
Johns-Manville, Inc.

Inspecting Engineers & Chemists
Pittsburgh Testing Lab.

Instruments Measuring, Testing and Recording
Economy Electric Devices Co.
Elec. Service Supplies Co.
General Electric Co.
Johns-Pratt Co.
Roller-Smith Co.
Western Electric Co.
Westinghouse E. & M. Co

Insulating Cloth, Paper and Tape
Anchor-Webbing Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Johns-Manville, Inc.
Mica Insulator Co.
Okonite Co.
Sherwin-Williams Co.
Stand. Underground Cable Co.
Westinghouse E. & M. Co.

Insulating, Silk & Varnish
Irvington Varnish & Ins. Co.

Insulation (See also Paints)
Anderson Mfg. Co., A. & J. M.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Johns-Manville, Inc.
Mica Insulator Co.
Okonite Co.
Sherwin-Williams Co.
Westinghouse E. & M. Co.

Insulation Slots
Irvington Varnish & Ins. Co.

Insulators (See also Line Materials)
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Flood City Mfg. Co.
General Electric Co.
Hemingray Glass Co.
Irvington Varnish & Ins. Co
Ohio Brass Co.
Western Electric Co
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Cranes, Hoists and Lifts)
Buckeye Jack Co.
Buda Co.
Columbia Machine Works & M. I. Co.
Duff Mfg. Co.
Elec. Service Supplies Co.
Templeton-Kenley Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.
Symington Co., T. H.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
Anderson Mfg. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.
Ohio Brass Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Arresters
Electric Power Equipt. Co.

Lightning Protection
Anderson Mfg. Co., A. & J. M.
Electric Power Equipt. Co.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson Mfg. Co., A.&J.M.
Archbold-Brady Co.
Dossert & Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
Johns-Manville, Inc.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse E. & M. Co.

Locomotives, Electric
Baldwin Locomotive Works
General Electric Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricating Engineers
Galena Signal Oil Co
Standard Oil Co. of Ind.
Texas Co., The
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co.
Standard Oil Co. of Ind.
Texas Co., The
Universal Lubricating Co.

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.

Manganese Steel Switches Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters (See Instruments)

Manganese Track-Work
Indianapolis Switch & Frog Co.

Molding, Metal
Allis-Chalmers Mfg. Co.
National Metal Molding Co.

Motor Buses (See Buses, Motor)

Motor Leads
Dossert & Co.

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
Allis-Chalmers Mfg. Co.
General Electric Co.

Motormen's Seats
Brill Co., J. G.
Elec. Service Sup. Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Bemis Car Truck Co.
Bethlehem Steel Co.
Hubbard & Co.

Ohmmeters
Roller-Smith Co.

Oil Purifiers
De Laval Separator Co.

Oils (See Lubricants).

Omnibuses (See Buses, Motor)

Oxygen
International Oxygen Co.

Oxy-Acetylene (See Cutting Apparatus, Oxy-Acetylene)

Packing
Elec. Service Supplies Co.
Johns-Manville, Inc.
Westinghouse E. & M. Co.

Paint Guns
De Villiss Mfg. Co.

Paint. Spraying Devices
De Villiss Mfg. Co.

Painting Equipt., Portable
Paasche Air Brush Co.

Paints and Varnishes (Insulating)
Irvington Varnish & Ins. Co.
Sherwin-Williams Co.

Paints, Varnishes, Preservatives
Beckwith-Chandler Co.
Joseph Dixon Crucible Co.
Sherwin-Williams Co.

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co
Sherwin-Williams Co.

Pavement Breakers
Ingersoll-Rand Co.

Paving Brick Vitrified
Nat'l Paving Brick Mfrs. Assn.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdy. Co

Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Standard Steel Works Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Plugs
National Metal Molding Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Bates Exp. Steel Truss Co.
Elec. Ry. Equipment Co.
Hubbard & Co.
Western Electric Co.

Pole Reinforcing
Hubbard & Co.

Poles & Ties Treated
Bell Lumber Co.
Baker Wood Preserving Co.
Carney & Co., B. J.
Cook Pole & Tie Co.
International Creosoting & Construction Co.
Long Bell Lumber Co.
National Pole Co.

Poles, Ties, Posts, Piling & Lumber
Baker Wood Preserving Co
Bell Lumber Co.
Carney & Co., B. J.
Cook Pole & Tie Co.
International Creosoting & Construction Co.
Long Bell Lumber Co.
National Pole Co.
Southern Cypress Mfg. Assn.

Poles, Trolley
Bell Lumber Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

Porcelain Special High Voltage
Lapp Insulator Co., Inc.

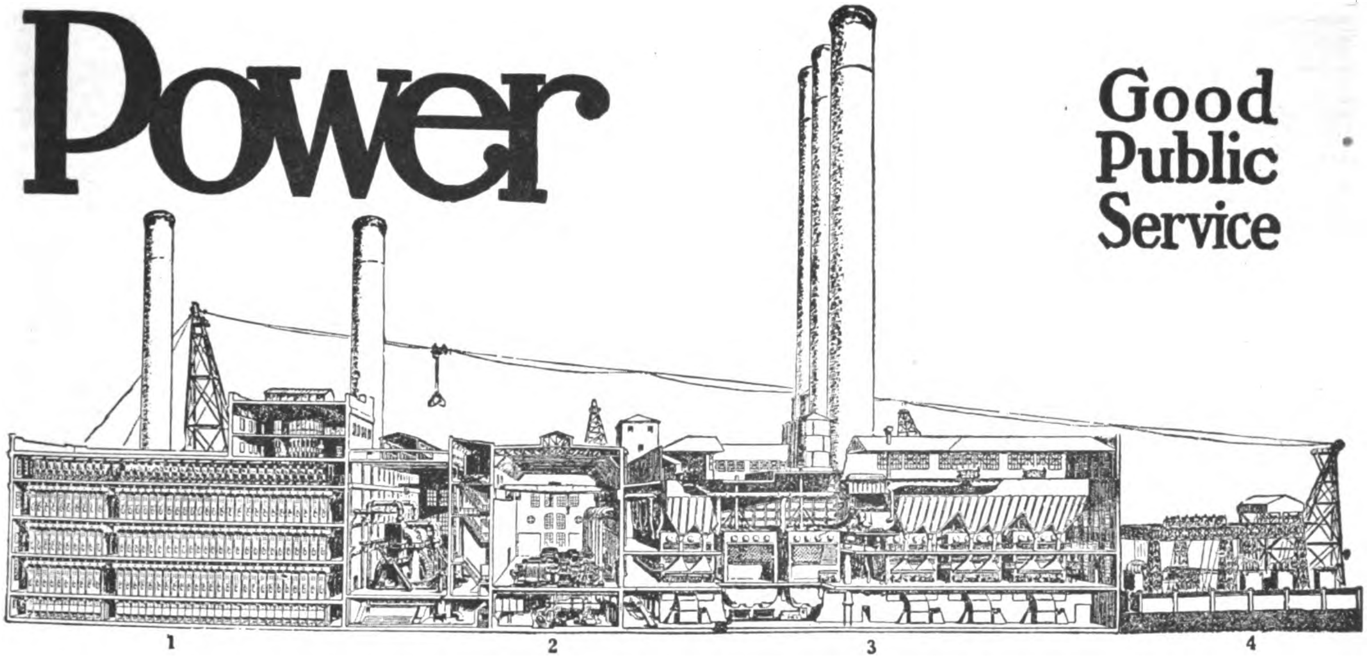
Portable Grinders
Buda Co.

Potheads
Okonite Co.

Power Saving Devices
Economy Electric Devices Co.
National Ry. Appliance Co.

Power

Good Public Service



A section through the Westport station, showing: 1—Switch House; 2—Main Turbine Room, where seven turbines generate 166,000 H. P.; 3—Boiler Room, showing a few of the 40 Edge Moor Boilers in service; 4—Outdoor Substation.

WESTPORT—

Baltimore's Central Station Operates 40 Edge Moor Boilers

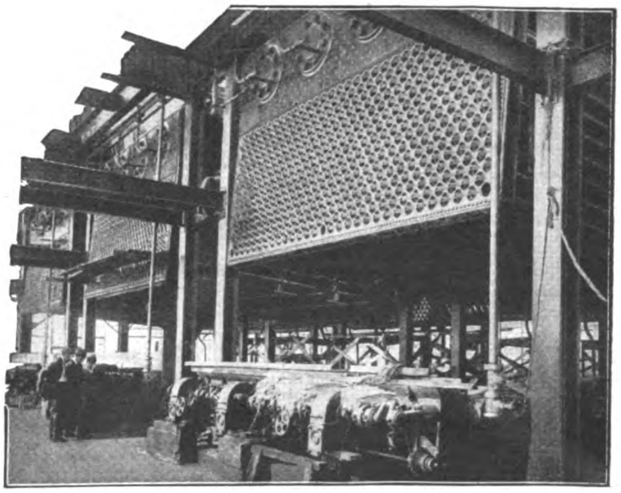
To supply the power and light needs of the Seventh City is a task requiring efficient management and dependable equipment. The Westport station of the Consolidated Gas, Electric Light and Power Company has both.

The progressive character of the Consolidated management is indicated by its extensive advertising campaign, impressing upon Baltimoreans the value of good public service.

Forty Edge Moor Boilers totalling more than 40,000 H.P. supply the steam used by seven great turbines in generating Baltimore's electricity.

Executives of other progressive plants will find much of interest in the Edge Moor catalogue—sent free upon request.

Below are shown three 1049 H. P. Edge Moor Boilers during erection at Westport.



EDGE MOOR IRON COMPANY
Established 1868
EDGE MOOR, DELAWARE
New York Chicago St. Paul Boston Pittsburgh Charlotte

EDGE MOOR Water Tube BOILERS

EDGE MOOR BOILERS EDGE MOOR, DEL. U.S.A.

FOR INCREASED FUEL ECONOMY

Pressure Regulators
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.

Rail Joints—Welded
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Lorain Steel Co.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Rail Welding
Metal & Thermit Corp.
Rail Welding & Bonding Co.
Railway Track-work Co.

Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Ohmer Fare Register Co.
Rooke Automatic Rg. Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Elec. Service Sup. Co.

Resistances
Consolidated Car Heat. Co.

Resistance, Wire and Tube
Driver-Harris Co.
General Electric Co.
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Roofing Asbestos (Car)
Johns-Manville, Inc.
Pantasote Co., Inc.

Roofs
Haskelite Mfg. Co.

Rosettes
National Metal Molding Co.

Sand Houses
Hetherington & Berner, Inc.

Sand Dryers
Hetherington & Berner, Inc.

Sand Storage
Hetherington & Berner, Inc.

Sanders, Track
Brill Co., The J. G.
Elec. Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
St. Louis Car Co.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.

Seats, Bus
Brill Co., J. G., The
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co, The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
Pantasote Co., Inc.
St. Louis Car Co.

Second Hand Equipment
Archer & Baldwin, Inc.
Electric Equipment Co.
Hyman-Michaels Co.
Transit Equipment Co.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings, Center and Side)

Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc
U. S. Electric Signal Co.
Wood Co., Chas. N.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc
U. S. Electric Signal Co.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A.&J.M.
Columbia Machine Works & M. I. Co.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
More-Jones Metal & Brass Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Columbia Machine Works & M. I. Co.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Soaps
Sherwin-Williams Co.

Sockets & Receptacles
Johns-Manville, Inc.
National Metal Molding Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Irvington Varnish & Ins. Co.

Solderless Connectors
Frankel Connector Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Standard Steel Works Co.
St. Louis Car Co.

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Stair Steps, Safety
Irving Iron Works

Steel and Steel Products
Carnegie Steel Co.

Steps, Car
Brill Co., J. G., The
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Subway Boxes
Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switches, Safety
Johns-Pratt Co.

Switchboxes
Johns-Manville, Inc.

Switches, Selector
Nichols-Lintern Co.

Switch Stands
Indianapolis Switch & Frog Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Switches and Switchboards
Anderson Mfg. Co., A. & J.M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Synchroscopes
Roller-Smith Co.

Tamper Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.
Western Electric Co.

Terminals, Cable
Std. Underground Cable Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heat. Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Tickets & Transfers
Globe Ticket Co.

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

Ties, All-Metal
Metal Safety R. R. Tie Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

Ties and Tie Rods, Steel
Carnegie Steel Co.
International Steel Tie Co.

Tool Steel
Bethlehem Steel Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Torches, Acetylene (See Cutting Apparatus)

Tower Wagons and Auto Trucks
McCardell & Co., J. R.

Towers and Transmission Structures
Archbold-Brady Co.
Westinghouse E. & M. Co.

Track Grinders
Metal & Thermit Corp.
Railway Track-work Co
Seymour Rail Grinder Co., E. P.

Trackless Trolley Cars
Brill Co., J. G., The
Brockway Corp.
St. Louis Car Co.

Track, Special Work
Bethlehem Steel Co.
Buda Co.
Columbia Machine Works & M. I. Co.
Indianapolis Switch & Frog Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr. & Co., Inc., W.

Transfer (See Tickets)

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co

Transmission Towers and Structures
American Bridge Co.
Bates Exp. Steel Truss Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Material, Overhead
Elec. Service Supplies Co.
Flood City Mfg. Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolleys & Trolley Systems
Ford Chain Block Co.

Trolley Shoes
Miller Trolley Shoe Co.

Trolley Wheel Bushings
Flood City Mfg. Co.
More-Jones Brass & Metal Co.

Trolley Wheel & Harps
Flood City Mfg. Co.
More-Jones Brass & Metal Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co
Bridgeport Brass Co.
Page Steel & Wire Co.
Roebling's Sons Co., J. A
Western Electric Co.

Trucks, Car
Baldwin Locomotive Works
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg.Co
St. Louis Car Co.

Tubing, Yellow & Black Flexible Varnish
Irvington Varnish & Ins. Co

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Turbines, Water
Allis-Chalmers Mfg. Co.

Turnstiles
Damon-Chapman Co.
Elec. Service Supplies Co.
Percy Mfg. Co., Inc.
Turnstile Car Corp.

Turntables
American Bridge Co.
Indianapolis Switch & Frog Co.

Valves
Ohio Brass Co
Westinghouse Tr. Br. Co

Varnished Papers & Silks
Irvington Varnish & Ins. Co.

Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Vitrified Paving Brick
Nat'l Paving Brick Mfrs. Assn.

Voltmeters
Roller-Smith Co.

Welded Rail Joints
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.

Welders, Portable Electric
Elec. Ry. Improvement Co.
Indianapolis Switch & Frog Co.
Liteweld Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co

Welding & Cutting Tools
International Oxygen Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
General Electric Co
Indianapolis Switch & Frog Co.
International Oxygen Co.
Liteweld Co.
Metal & Thermit Corp.
Ohio Brass Co.

Rail Welding & Bonding Co.
Railway Track-work Co
Westinghouse E. & M. Co

Welding Steel
Elec. Ry. Improvement Co.
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Welding Wire & Rods
Page Steel & Wire Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.
Carnegie Steel Co.
Griffin Wheel Co.
Standard Steel Works Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Columbia Machine Works & M. I. Co.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M Co

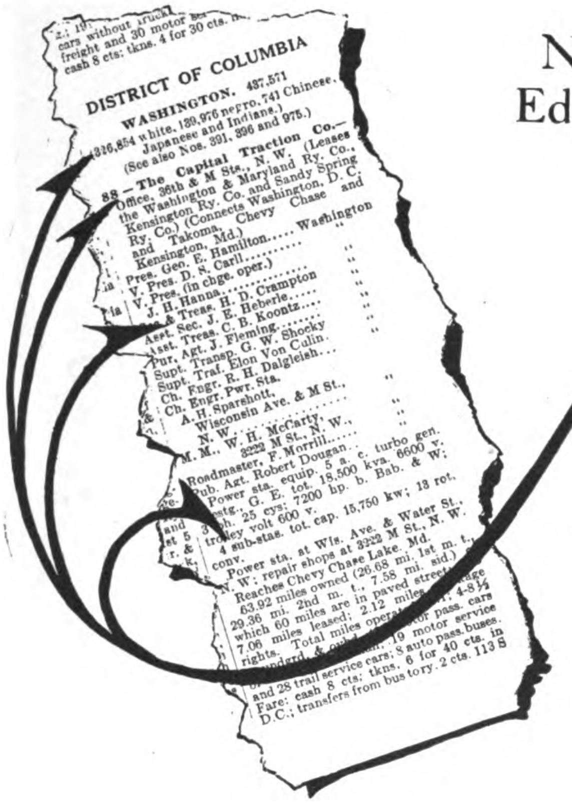
Wire, Copper Covered Steel
Page Steel & Wire Co.

Wire Rope
Roebling's Sons Co., J. A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co
Anaconda Copper Min. Co
Bridgeport Brass Co.
General Electric Co.
Indianapolis Switch & Frog Co.
Okonite Co.
Page Steel & Wire Co.
Roebling's Sons Co., J. A
Std. Underground Cable Co
Western Electric Co.
Westinghouse E. & M Co

Wood Preservatives
Baker Wood Preservative Co.
Sherwin-Williams Co.

McGRAW ELECTRIC RAILWAY DIRECTORY



cars without truck
freight and 30 motor
cash 8 cts; tkns. 4 for 30 cts.

DISTRICT OF COLUMBIA

WASHINGTON. 437,571
(326,854 white, 109,976 negro, 741 Chinese,
Japanese and Indians.)
(See also Nos. 391, 396 and 975.)

88—The Capital Traction Co.—
Office, 36th & M Sts., N. W. (Leases
the Washington & Maryland Ry. Co.,
Kensington Ry. Co. and Sandy Spring
Ry. Co.) (Connects Washington, D. C.
and Takoma, Chevy Chase and
Kensington, Md.)
Pres. Geo. E. Hamilton..... Washington
V. Pres. D. S. Carll.......... "
V. Pres. (in chge. oper.)
J. H. Hanna.............. "
& Treas. H. D. Crampton "
Asst. Sec. J. E. Heberle..... "
Asst. Treas. C. B. Koontz.... "
Pur. Agt. J. Fleming........ "
Supt. Transp. G. W. Shocky
Supt. Traf. Elon Von Culin.
Ch. Engr. R. H. Dalgleish...
Ch. Engr. Pwr. Sta.
A. H. Sparshott,
Wisconsin Ave. & M St.,
N. W.............. "
M. M., W. H. McCarty,
3222 M St., N. W., "
Roadmaster, F. Morrill.....
Pub. Agt. Robert Dougan..
Power sta. equip. 5 a. c. turbo gen.
G. E. tot. 18,500 kva. 6600 v.
25 cys; 7200 hp. b. Bab. & W;
trolley volt 600 v.
4 sub-stas. tot. cap. 15,750 kw; 13 rot.
conv.
Power sta. at Wis. Ave. & Water St.,
N. W; repair shops at 3222 M St., N. W.
Reaches Chevy Chase Lake, Md.
63.92 miles owned (26.68 mi. 1st m. t.,
29.36 mi. 2nd m. t., 7.58 mi. sid.)
which 60 miles are in paved streets
7.06 miles leased; 2.12 miles 4-8½
rights. Total miles operated
19 motor service
and 28 trail service cars; 8 auto pass. buses.
Fare: cash 8 cts; tkns. 6 for 40 cts. in
D.C.; transfers from bus to ry. 2 cts. 113 S

New
Edition

Directory
Who's who
Census
Equipment

All the facts—all the figures —all the names!

IN FACT all the information you need if you're doing business, or contemplating business with this billion dollar transportation industry. A complete survey of the field, made through direct contact with every electric railway company in the United States, Canada, Mexico, and the West Indies.

The tremendous growth of the Electric Railway Industry is indicated by the huge expenditures contemplated. This naturally makes increased shop facilities necessary.

To sales organizations, manufacturers, engineers, supply distributors and others interested in "the shop" the McGraw Electric Railway Directory is an invaluable source of information.

Leading Features

1—**Complete list of every recorded electric railway company in the United States, Canada, Mexico, and the West Indies.**

2—**List and addresses of officials, superintendents, department heads and purchasing agents, corrected to date of issue.**

3—Addresses of repair shops.

4—Addresses of power plants and list of equipment.

5—Lists of sub-station equipment.

6—Transmission and trolley voltage.

7—Whether doing a light and power business.

8—Mileage of track.

9—Number and kinds of cars used.

10—Number of motor buses used.

11—Amusement parks owned or reached.

12—Rates of fare.

Published annually

Price $7.50

Order now

E.
R.
J.
II.

**Directory
Department,
Electric Railway
Journal
10th Ave. and
36th St.,
New York, N. Y.**

Gentlemen: — Will you please send me:—

......copies of New McGraw Electric Railway Directory.

or

......further information about the McGraw Electric Railway Directory.

(Check one)

Name ....

Street ....

City .... State...........

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page

A

Ajax Metal Co..............130
Allis-Chalmers Mfg. Co.......150
Allison Co., J. E............. 67
Alphaduct Co................148
Alumino-Thermic Corp........ 97
Amer. Brake Shoe & Fdy. Co...150
American Bridge Co.......... 67
American Car Co.............159
American Electrical Works....144
American Engineering Co...... 25
American Steel & Wire Co......147
Anaconda Copper Mining Co.... 34
Anchor Webbing Co...........139
Anderson Mfg. Co., A. & J. M.. 78
Archbold-Brady Co........... 67
Archer-Baldwin, Inc..........151
Arnold Co., The............. 66

B

Babcock & Wilcox Co.........146
Baker Wood Preserving Co....145
Baldwin Locomotive Works....129
Bates Exp. Steel Truss Co..... 47
Beckwith Chandler Co........111
Beeler, John A.............. 66
Bell Lumber Co..............149
Bemis Car Truck Co.......118-119
Bethlehem Steel Co........36, 120
Bibbins, J. Rowland 66
Bonney Vehslage Tool Co......149
Bridgeport Brass Co.........84-85
Brill Co., J. G...............159
Brockway Corp. 68
Buchanan & Layng Corp...... 67
Buckeye Jack Mfg. Co.........150
Buda Co..................... 28
Byllesby & Co., H. M 67

C

Cameron Electrical Mfg. Co....135
Carnegie Steel Co............ 96
Carney Co., B. J............. 40
Chillingworth Mfg. Co.........131
Cleveland Fare Box Co........138
Collier, Inc., Barron G. Co.....106
Columbia Machine Wks........112
Consolidated Car Fender Co....121
Consolidated Car Heating Co.... 92
Cook Pole & Tie Co..........145

D

Daman-Chapman Co..........141
Day & Zimmermann Co., Inc... 66
Dayton Mechanical Tie Co....80-83
De Laval Separator Co........101
De Vilbiss Mfg. Co., The.......133
Differential Steel Car Co......44-45
Dixon Crucible Co., Jos........137
Dossert Co. 27
Driver-Harris Co............. 35
Duff Mfg. Co................100

E

Eclipse Railway Supply Co....149
Economy Elec. Devices Co....21-23
Earll, C. I...................117
Edgemoor Iron Co............155
Electric Equipment Co........151
Electric Power Equip. Co...... 26
Electric Railway Equipment Co. 38
Electric Ry. Improvement Co... 46
Electric Service Supplies Co..10-11
Elliot-Thompson Co..........146

F

Flood City Mfg. Co...........104
Ford, Bacon & Davis.......... 66
Ford Chain Block Co.........136
"For Sale" Ads...............151
Frankel Connector Co.........139

G

Galena-Signal Oil Co.........48-49
General Electric Co.,
51-54 Back Cover
Gilbert & Sons Brass Foundry
Co., A. 150
Globe Ticket Co.............108
Godwin Co., W. S............144
Gold Car Heating & Ltg. Co....105
Griffin Wheel Co.............149

H

Hale-Kilburn Comany......102-103
Haskelite Mfg. Corp........42-43
"Help Wanted" Ads...........151
Hemingray Glass Co..........145
Hemphill & Wells 66
Hetherington & Berner, Inc....127
Heywood-Wakefield Co........140
Holst Englehard W.......... 66
Hubbard & Co............... 18
Hyman-Michaels Co...........151

I

Ideal Face Shield Co..........148
Industrial Works 135
Indianapolis Switch & Frog Co.. 77
Ingersoll-Rand Co. 32-33
International Creosoting & Construction Co. 24
International Oxygen Co.......150
International Register Co., The.138
International Steel Tie Co.,
Front Cover
Irving Iron Works Co......... 72
Irvington Varnish & Insulator
Co. 133

J

Jackson, Walter 66
Johnson & Co., J. R..........149
Johns-Pratt Co..............144
Johns-Manville, Inc.......... 90
Jeandron, W J..............137
Johnson Fare Box Co.........150

K

Kress & Co.................. 76
Kuhlman Car Co.............159

L

Lapp Insulator Co., Inc........131
Le Carbone Co...............137
Long-Bell Lumber Co......... 39
Liteweld Co..................147
Lorain Steel Co..............144

M

McCardell Co., J. R........... 88
McGraw-Hill Book Co., Inc.136, 140
McGuire Cummings Mfg. Co....146
Metal & Thermit Corp......... 30
Metal Safety Railway Tie Co...144
Miller Trolley Shoe Co.....114-115
Mica Insulator Co............ 93
More-Jones Brass & Metal Co... 89
Morton Mfg. Co..............149

N

Nachod Signal Co., Inc........134
National Brake Co., Inc........ 65
National Carbon Co., Inc......153
National Metal Molding Co....107
Nat'l Paving Brick Mfrs. Assn. 41
National Pneumatic Co., Inc..12-13
National Pole Co............. 31
National Railway Appliance Co.150
New York Switch & Crossing Co.144
New York Transportation Co... 73
Nichols, Lintern Co..........141
Nuttall Co., R. D........113, 142

O

Ohio Brass Co...............8, 9
Ohmer Fare Register Co.......148
Okonite Co., The............. 15
Ong, Joe R.................. 66
Oskel Equipment Co.......... 88

P

Paasche Air Brush Co......... 90
Page Steel & Wire Co.........132
Pantasote Co., Inc............ 70
Parsons, Klapp, Brinckerhoff &
Douglas 66
Paterson Vehicle Co.......... 91
Paxson Co., J. W.............144
Percy Mfg. Co...............110
Pierce-Arrow Motor Car Co.... 71
Pittsburgh Test. Lab.........146
Portland Cement Association.... 95
Positions Wanted and Vacant...151

R

Railway Track-work Co....... 14
Railway Utility Co...........143
Rail Welding & Bonding Co.... 50
Ramapo-Ajax Co.............132
Richey, Albert S............. 66
Rooke Automatic Register Co..109
Roebling's Sons Co., John A...144
Roller-Smith Co.............. 37
Root Spring Scraper Co.......142

S

St. Louis Car Co............86-87
Safety Car Devices Co......... 16
Samson Cordage Works 116
Sanderson & Porter 66
Searchlight Section 151
Seymour Rail Grinder Co......147
Shaw, Henry M...............144
Sherwin-Williams Co.......... 79
Smith Heater Co., Peter, The..150
Southern Cypress Mfrs. Assn...134
Standard Oil Co. of Indiana.... 99
Standard Steel Works.........124
Stackpole Carbon Co.......... 98
Standard Underground Cable Co.144
Star Brass Works............122
Stone & Webster 66
Stevens & Wood, Inc.......... 66
Stucki & Co., A..............150
Symington Co., T. H..........126

T

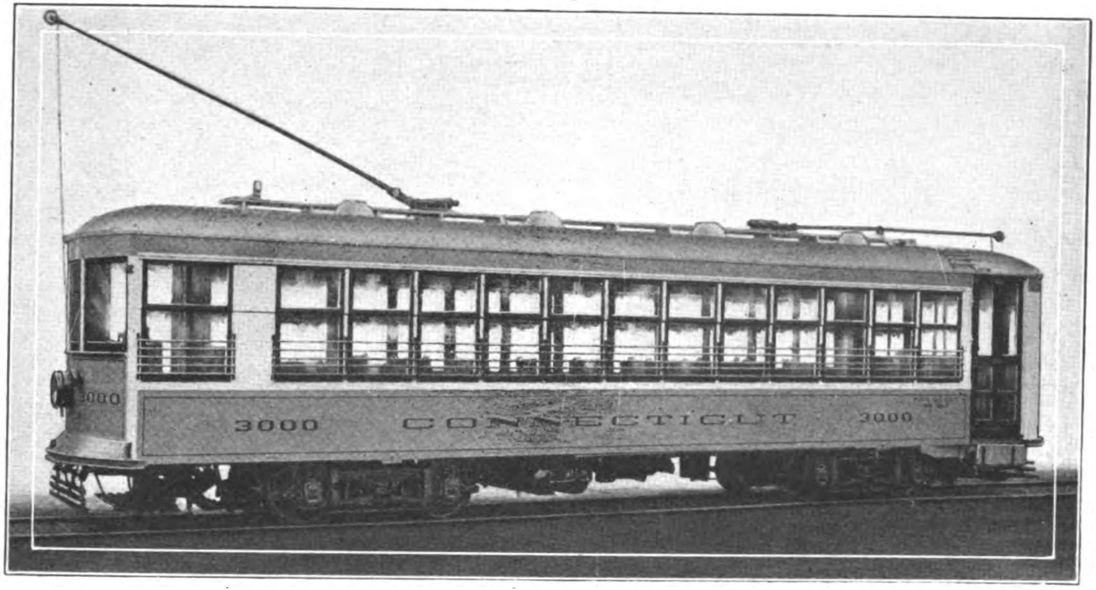
Templeton, Kenly & Co., Ltd.... 20
Texas Co., The.............74-75
Thomas Car Works, P. A......125
Tool Steel Gear & Pinion Co....123
Turnstile Car Co............. 94
Timken-Detroit Axle Co...... 69
Transit Equipment Co........151

U

Universal Crane Co........... 19
Universal Lubricating Co......149
U. S. Electric Signal Co......145
United States Graphite Co.....147

W

"Want" Ads 151
Walker Amusement Co.........148
Wason Mfg. Co...............159
Western Electric Co........29, 128
Westinghouse Elec. & Mfg. Co.2, 4-7
Westinghouse Traction Brake Co. 17
White Engineering Corp., The
J. G....................... 66
Wish Service, The P. Edw..... 67
Wood Co., Chas. N............144
Wortham, Edwin 67



Double-Truck Safety Cars Furnished by the Wason Manufacturing Company

SAFETY CARS

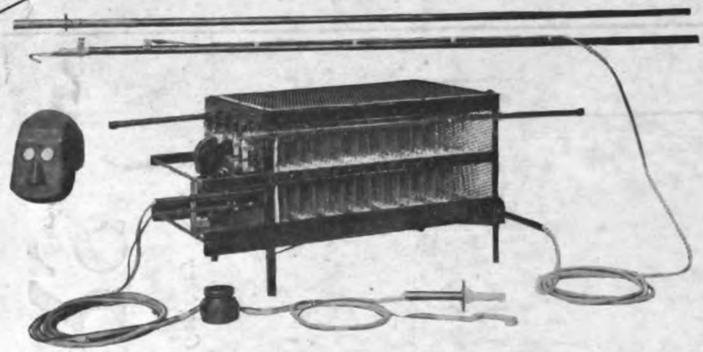
Brill 77-E Trucks

Reduced operating cost, quicker acceleration and adaptability to all classes of city service recommend the use of safety cars in place of the heavier and consequently more expensively operated types of double truck equipment.

The new double truck safety cars, such as furnished the Connecticut Company by our Wason Plant, are equipped with quadruple 25 Hp. motors mounted on Brill 77-E-1 Trucks with 26-in. diameter wheels. They are 40 ft. 3 in. long overall, have a 4 ft. 3 in. platform on each end being for double-end operation, are 8 ft. wide over posts, seat 53 passengers, and weigh but 27,700 lb. complete ready for operation.

Copy of Light Weight Car Catalog No. 266 mailed upon request.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — G. C. KUHLMAN CAR CO. — WASON MANF'G CO.
ST. LOUIS MO. CLEVELAND, OHIO. SPRINGFIELD, MASS.



Approved!

Type AW Resistor Arc Welder

Just hook the Type AW Welder to a trolley wire and you get speedy production combined with low cost of operation.

It is light in weight and is easily handled by workmen.

It does a good job in quick time and at minimum cost.

It withstands the wear of weather.

It is specially suitable for welding rail bonds and other track work.

Ask the G-E Sales Office nearest you for complete information.

GENERAL ELECTRIC COMPANY
Schenectady, N. Y.

Sales Offices in all large cities

GENERAL ELECTRIC

McGraw-Hill Co., Inc.
March 29, 1924
Twenty Cents Per Copy

ELECTRIC RAILWAY JOURNAL

TF
701
.E7

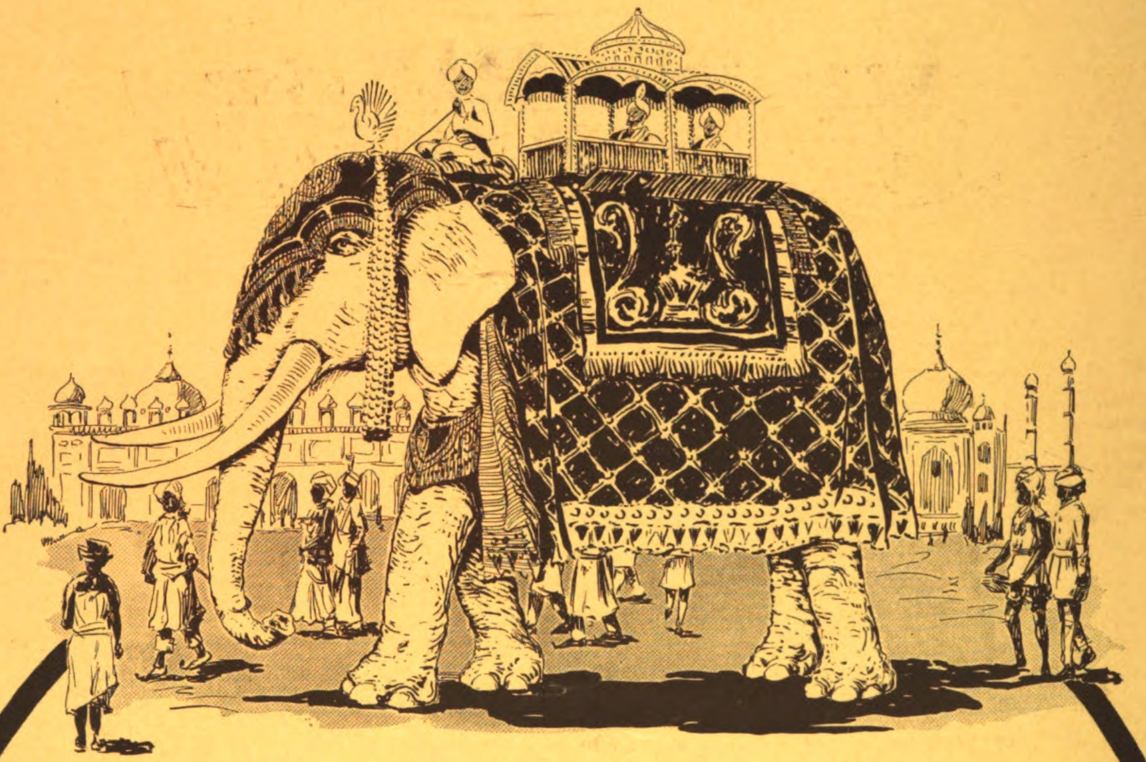
PROPERTY OF
TECHNICAL PUBLICATIONS LIB
U. OF VA. SCHOOL OF ENGINEERIN

The Home of the Keystone Line

Electrical Equipment for Track, Line, Cars and Shops

This plant, the growth of years, stands as a monument to the reputation of ESSCO Service in the electric railway field. The well-known ESSCO Catalog No. 7 is the equipment buyer's guide of the industry. Make it serve you.

ELECTRIC SERVICE SUPPLIES CO.



"White Elephants"

White elephants in India are a matter of worship. They are used on royal occasions as a means of display. They perform no useful work and, consequently, give no return on their investment.

Many electric railway companies have "White Elephants" on their hands in the form of non-paying lines; unnecessarily heavy equipment; obsolete motors; antiquated substations, etc.

The Westinghouse Electric Company, through its experienced transportation specialists is ready to assist in the elimination of "White Elephants." Get in touch with the Transportation-Division Manager of the nearest Westinghouse district office.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

W WESTINGHOUSE ELECTRIC

Westinghouse

Vol. 63, *No.* 13 New York, March 29, 1924 *Pages* 489-528

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

MORRIS BUCK
Associate Editor
C. W. SQUIER
Associate Editor
JOHN A. MILLER, JR.
Assistant Editor
G. J. MACMURRAY
News Editor

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago
MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago
CARL W. STOCKS
Associate Editor

CONTENTS

Editorial 489

Records Facilitate Transportation Department Management 491

Co-operation of all branches of transportation department, together with adequate forms and filing system, gives the Chicago Surface Lines accurate employee records.

Chicago & Joliet One-Man Cars......................494

Auckland Will Make Extensive Improvements..........496

Making Tests to Save $15,000,000 a Year..............497

A joint capable of developing the full life of the rail would greatly reduce track reconstruction expenditures. Results of numerous tensile, bending and drop tests are given.

Span Wires Attached to Buildings....................499

Children Aid in Safety Campaign......................500

Railway Bus Sets Standard..........................500

Detroit Answers Motorbus Proposal....................501

Rapid Transit Commission and Department of Street Railways present a brief to the Common Council of the city in reply to a proposition to substitute buses of a new type carrying 250 passengers for the surface cars and proposed rapid transit system.

Medical Department in Milwaukee....................502

Measuring Electrolytic Currents in Soil................503

BY B. A. WILLIAMSON.

Two new methods of measurement are proposed, one based on substitution of known resistance and the other on balancing the current to give zero galvanometer reading.

Noise in London Cars Photographed..................506

The Readers' Forum................................506

Association News and Discussion....................507

A. R. E. A. Holds Largest Convention................507

Proceedings contain many points of interest to electric railway engineers, the gist of which is given in this issue. National Railway Appliance Association and Signaling Section A. R. A., also hold meetings.

American Association News 511

Electric Railway Men Present Case on Section 15a.....511

Maintenance of Equipment 514

News of the Industry..............................517

What Good Is It?

MANY years ago William Morris said: "Have nothing in your room which you do not believe to be beautiful or know to be useful."

You have a copy of the ELECTRIC RAILWAY JOURNAL in your room now. Does it qualify? Since this paper is essentially a practical tool for railway men we may disregard the first classification and consider only the question of utility. What good is it?

Evidence is continually reaching us to show that the JOURNAL is of real practical value to electric railway men. An equipment engineer writes to us to say that his company is about to equip all of its cars with a device which first came to his attention in the pages of the JOURNAL. After reading a description of it, he was so much interested that he obtained a sample equipment from the manufacturer. The satisfactory performance of the sample led eventually to the purchase of similar devices for all the cars on his property.

In the same mail with the foregoing letter came an inquiry from another railway, asking where it could purchase a utility car of the type which had been described in a recent issue of the JOURNAL. These instances are in themselves not particularly noteworthy, because similar instances occur so frequently. But they certainly show that the JOURNAL does qualify under the head of being useful.

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

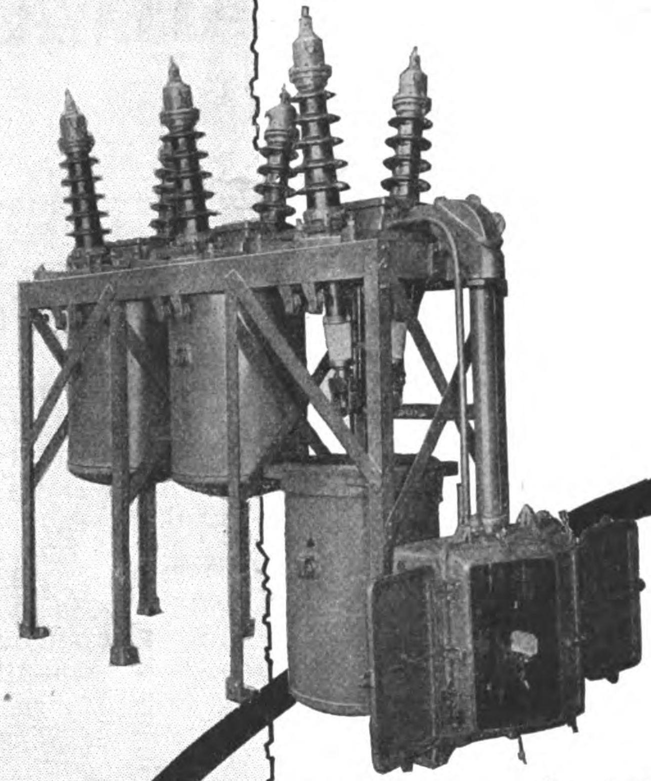
Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."
Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingeniería Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $1 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.
Copyright, 1924, by McGraw-Hill Company, Inc.
Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

Number of Copies Printed, 6,065 **Advertising Index—Alphabetical, 40; Classified, 36, 38; Searchlight Section, 35**

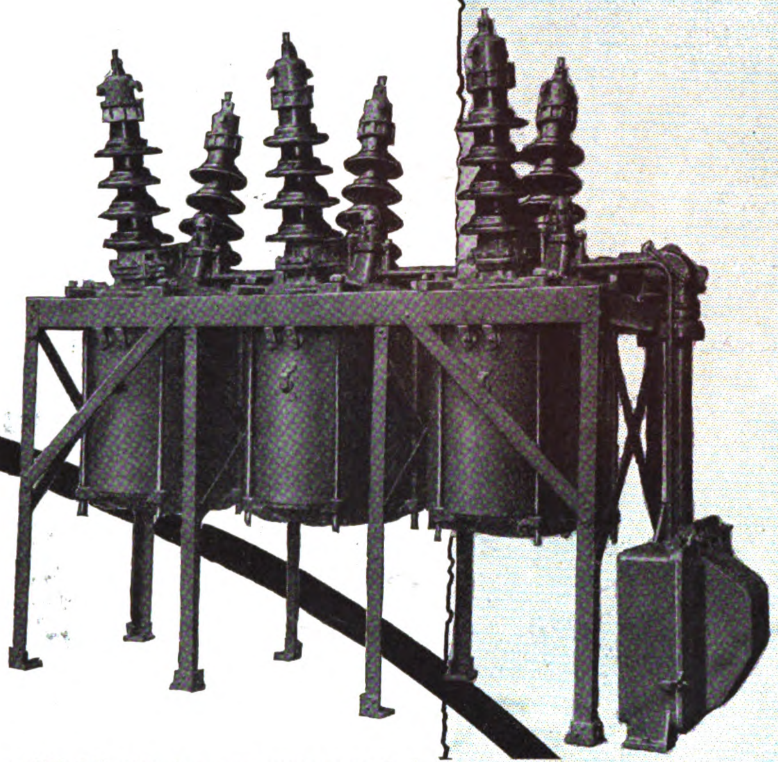


Type "G-22," 400 Ampere, 50,000 Volt, 3 Pole, Single Throw, Electrically Operated Oil Circuit Breaker.
Interrupting Capacity at Rated Voltage, 8700 Amperes.

TYPE "G-22" OIL CIRCUIT BREAKERS: A complete line of high capacity, round tank, oil circuit breakers for indoor and outdoor service is available for use on systems where large amounts of power are concentrated. The Type "G-22" oil circuit breakers are made for frame mounting up to, and including, 88,000 volts; for 110,000 volts and above, floor mounting breakers only are furnished; they can be either manually or electrically operated.

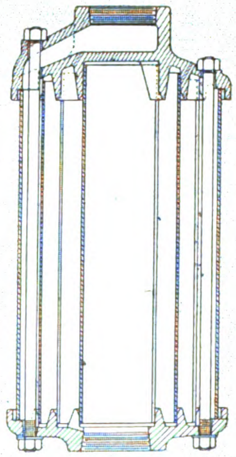
WESTINGHOUSE ELECTRIC

Westinghouse



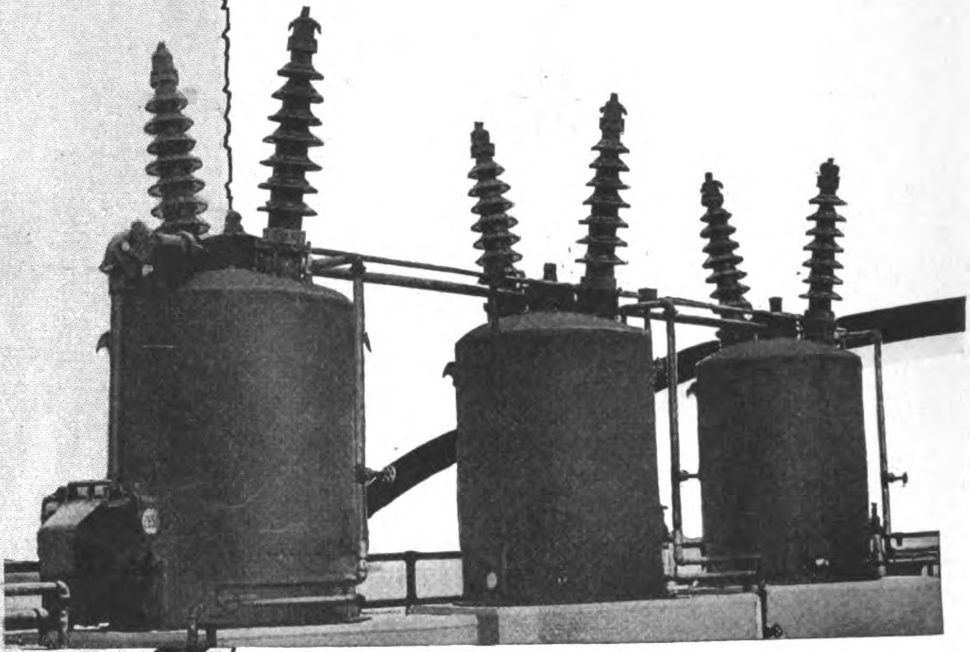
Type "G-2," 400 Ampere, 73,000 Volt, 3 Pole, Single Throw, Electrically Operated Outdoor Oil Circuit Breaker. Interrupting Capacity at Rated Voltage, 6500 Amperes.

MUFFLERS: When a circuit breaker, equipped with mufflers, opens a heavy short circuit, the air in the top chamber is forced out through the muffler, in advance of the arc gases rising through the oil, thereby preventing the possibility of a violent explosion in the breaker structure due to the mixture of oxygen and arc gases. The rupturing capacity and severity of the duty cycle which a given breaker structure will handle is thereby greatly increased.



Sectional View of Muffler used with Westinghouse Oil Circuit Breakers.

Westinghouse

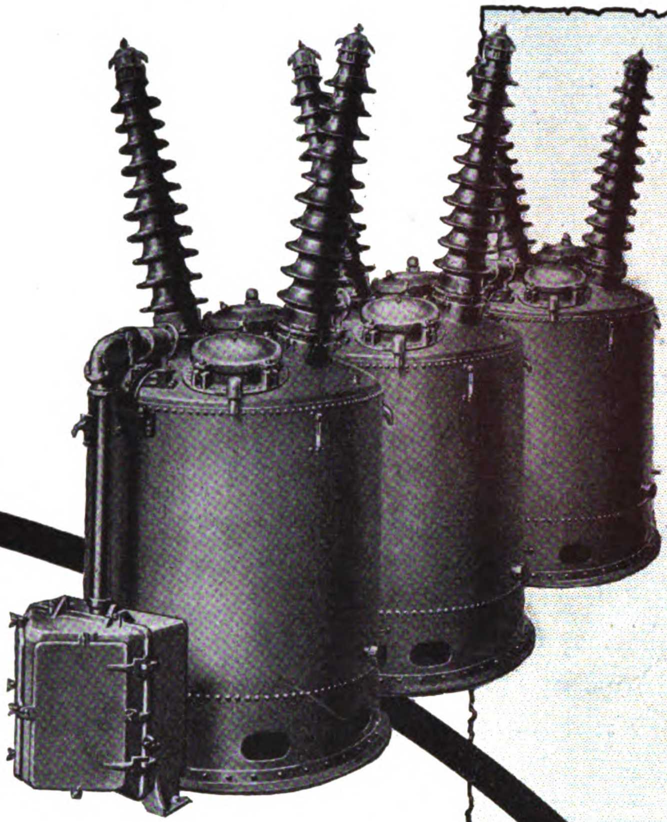


Type "G-2," 400 Ampere, 110,000 Volt, 3 Pole, Single Throw, Electrically Operated Floor Mounting Oil Circuit Breaker. Interrupting Capacity at Rated Voltage, 5300 Amperes.

HIGH SPEED CONTACT SEPARATION: The effectiveness of oil circuit breakers is greatly increased by reducing the duration of the arcing time. Because of the inertia of the moving elements of high tension breakers, it is not possible to accelerate them to the same extent as the moving elements of low tension breakers; to obtain quick rupturing of the arc in high tension breakers, high speed contacts, similar to those in our other G line of breakers, have been developed which give approximately the same speed of contact separation on high tension breakers as secured on low tension breakers.

50 KV. Oil Circuit Breaker Contact Details Showing Contacts Completely Open.

Westinghouse



Type "G-22," 400 Ampere, 154,000 Volt, 3 Pole, Single Throw, Electrically Operated Floor Mounting Oil Circuit Breaker. Interrupting Capacity at Rated Voltage, 5500 Amperes.

CONSTRUCTION: The "G-22" Breakers are of sturdy construction with all parts easily accessible, thus making for ease of installation and maintenance. The tanks are all of boiler type construction. The individual pole units are each equipped with a muffler. Effective means are provided to prevent communication of gases from one pole unit to the others or to the mechanism.

WESTINGHOUSE ELECTRIC

Westinghouse

Mr. Bibbins speaking:

Mr. J. Rowland Bibbins, Consulting Engineer, Washington, D. C., in an article recently published in this paper said this:

> "Here are essentials for the future toward which every large railway system should be working:
>
> Increase of 10 to 20 per cent in car schedule speed—imperative to meet automobile competition. * * *"

Maximum schedule speeds are possible with safety and comfort only on track kept in good condition. Most of our successful roads maintain good track by means of the grinders and welders shown on this page.

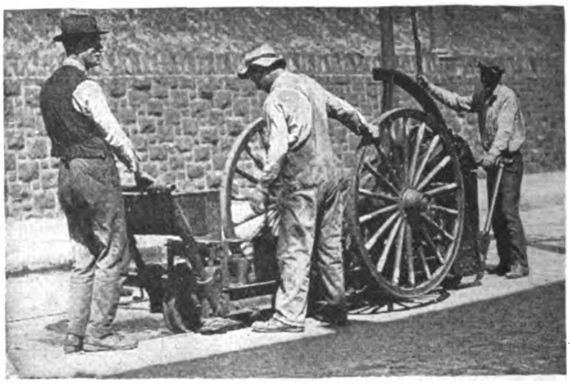
Do you know all about
all these machines?
Our bulletins tell all.

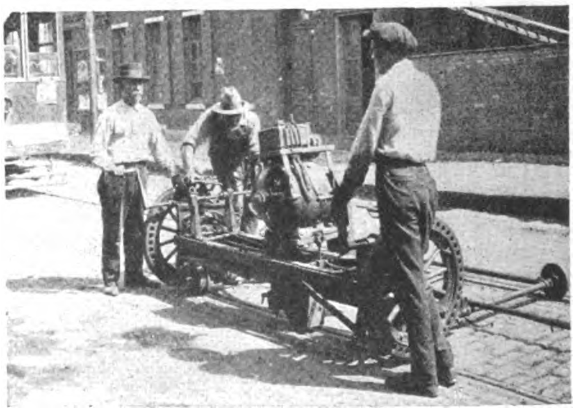
Railway Trackwork Co.

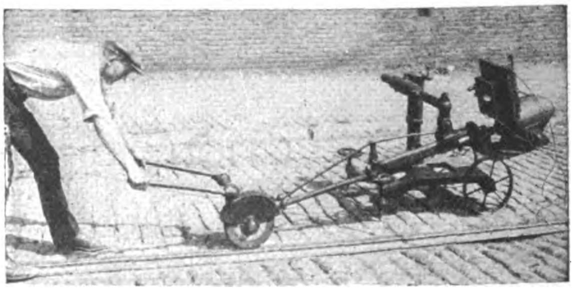
3132-48 East Thompson Street, Philadelphia

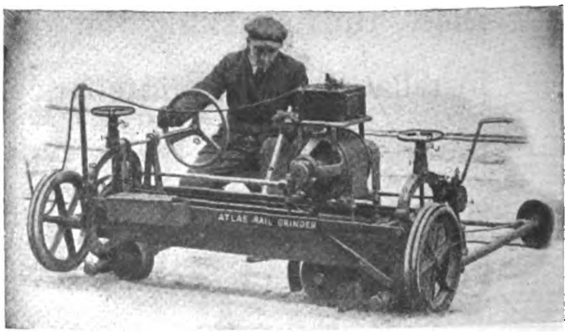
AGENTS:

Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London

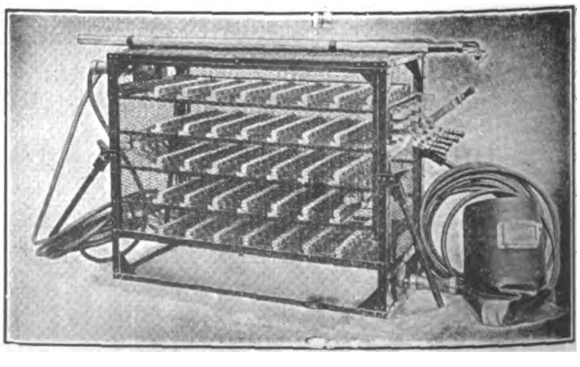

"Reciprocating" Track Grinder

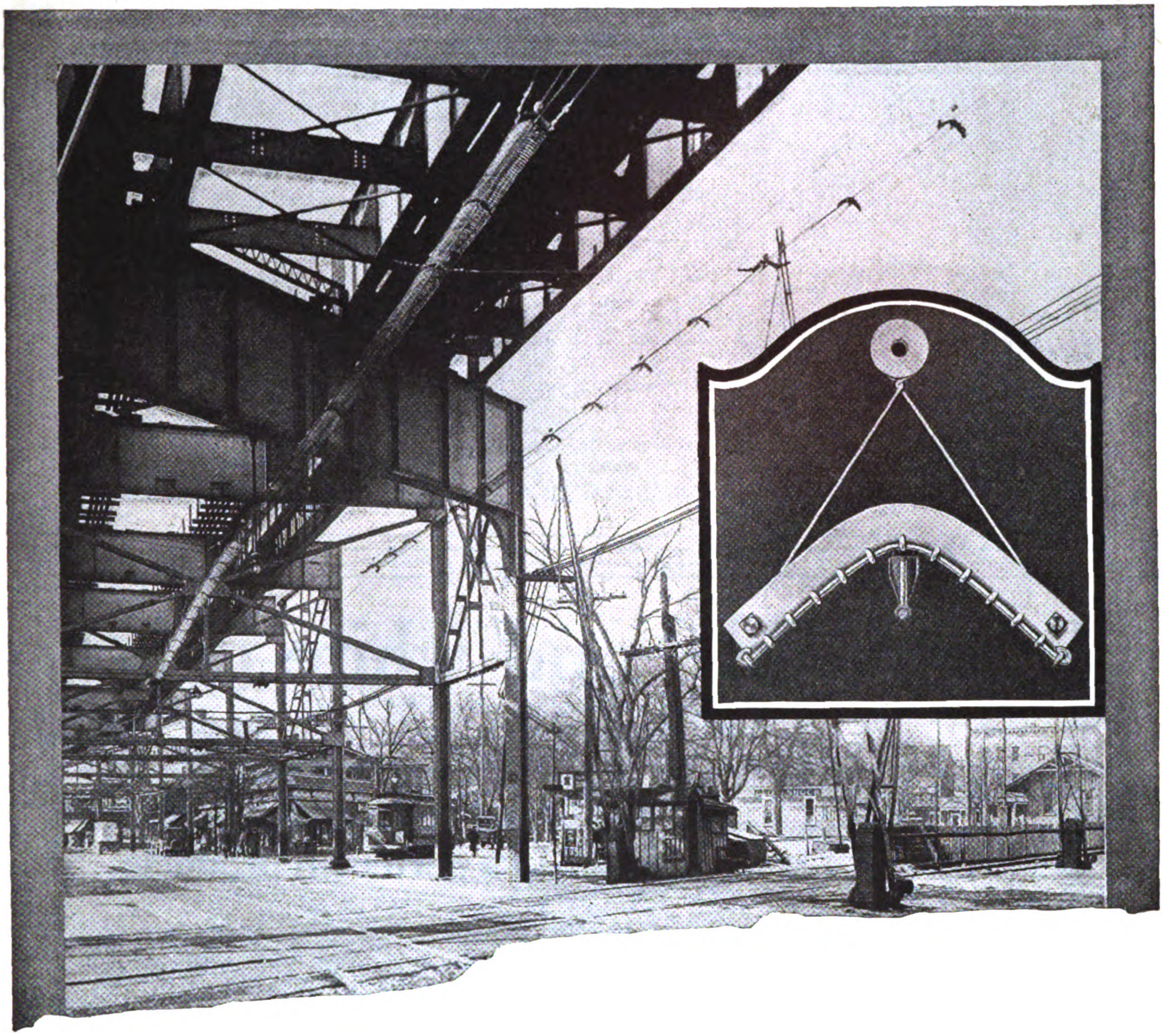

"Universal" Rotary Track Grinder


"Hercules" Rail Grinder



"Atlas" Rail Grinder


"Ajax" Electric Arc Welder



Crossing Accidents give no Warning

What is National Trolley Guard?

It is a wire mesh of galvanized iron or copper, formed into an inverted trough over the trolley wire. Being energized, it will carry the car safely on in case the wheel jumps the wire.

This is rather an unusual example of the installation of National Trolley Guard,—under an elevated structure and over a steam road crossing. Whether here or at a crossing in more open country, National Trolley Guard knows no confusion in the approach of a steam train and in the face of impending tragedy. Unlike the car man, it hasn't the human element. It is a safeguard that carries the car over the crossing even though the trolley wheel jumps the wire.

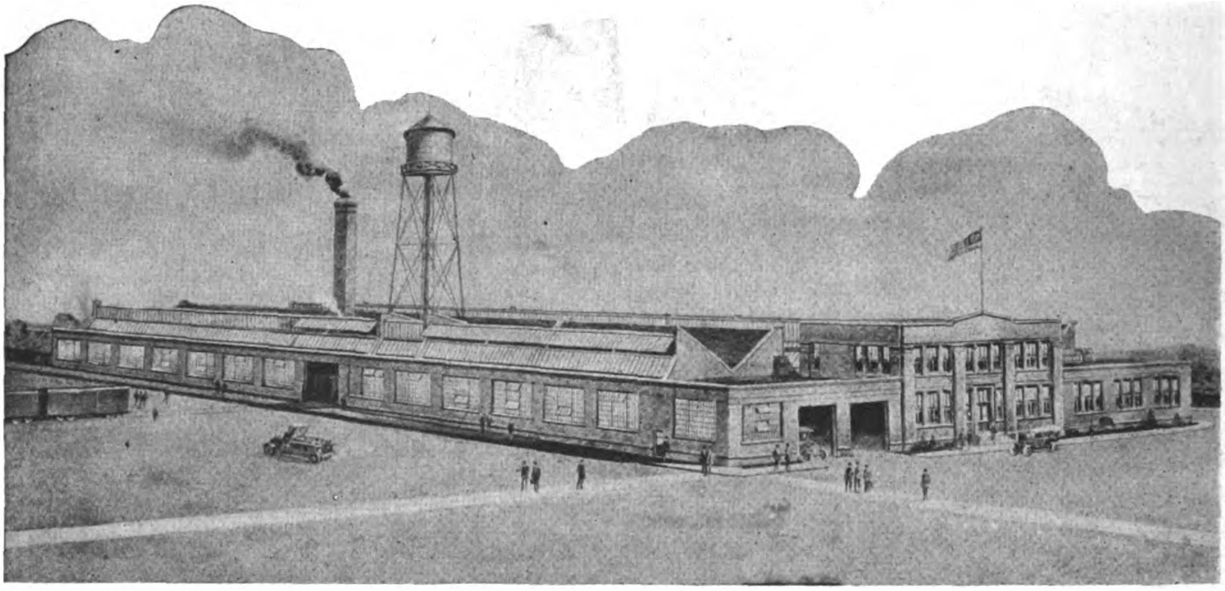
MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

Accidents or tragedies give no warning.
Put up National Trolley Guard before they visit your property.

THE OHIO BRASS CO.
Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE



Red marks—and white ones!

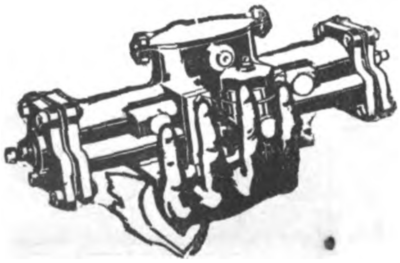
In this plant they represent selective steps toward the production of a perfected product

National Pneumatic Door Engines are subjected to a most rigorous system of inspection and testing from raw materials to the finished product.

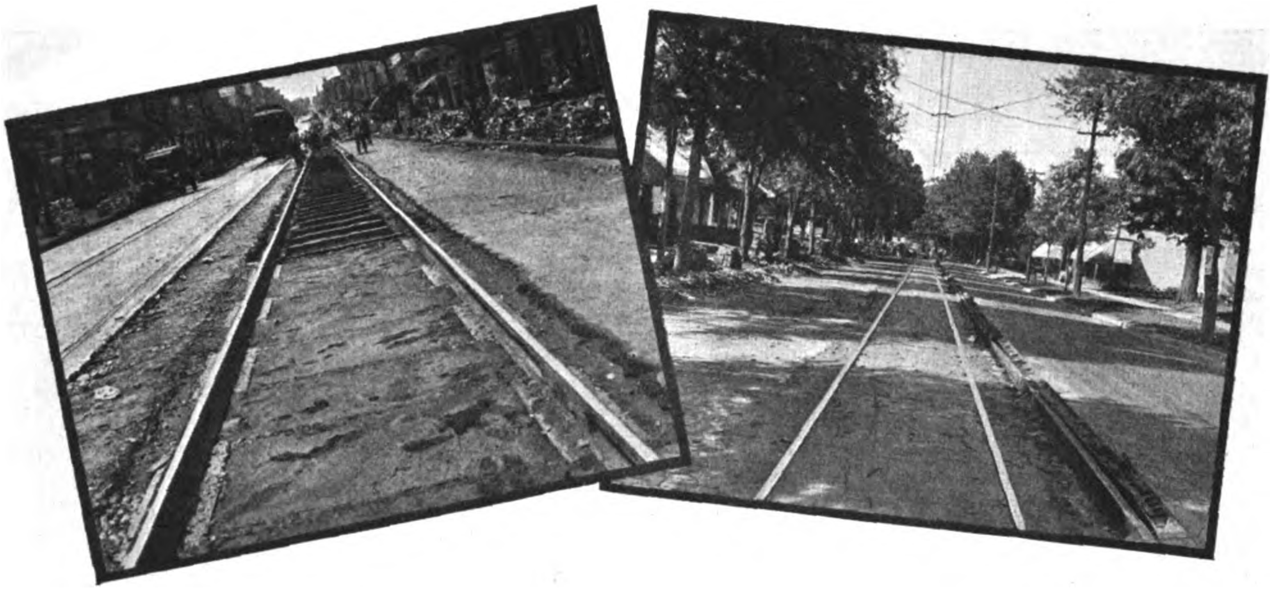
When an inspector finds the slightest flaw, the tiniest leak or discovers that a tolerance has been exceeded—a *red mark* goes on the part, and it is scrapped or sent back to be made right.

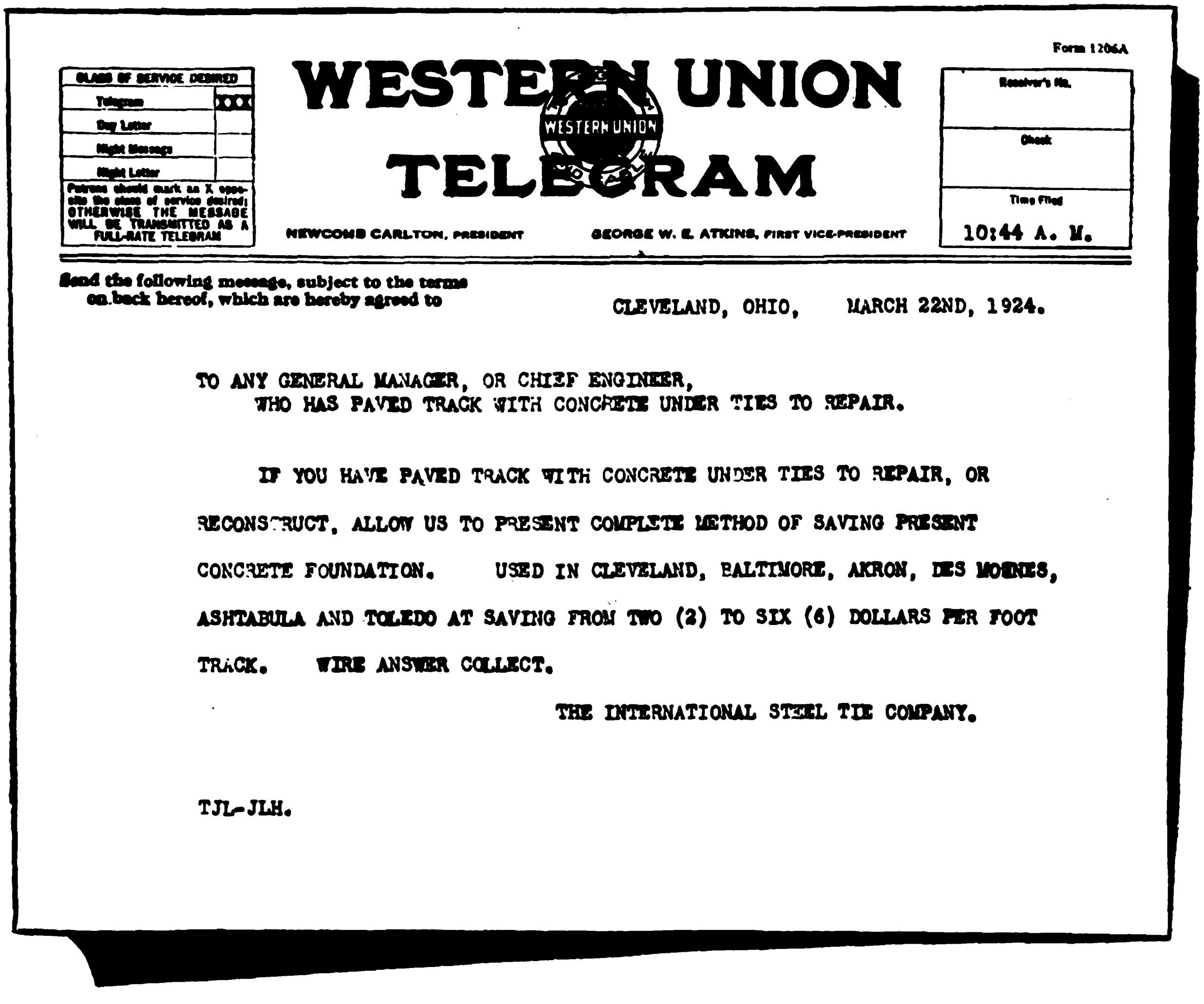
Only parts that are exactly correct, get *white marks* from the inspector or test expert, and without these white marks, no door engine ever reaches the shipping room.

That's why NATIONAL PNEUMATIC DOOR ENGINES always give satisfactory service, why they require so little attention, and why so many repeat orders arrive unsolicited at our office.



National Pneumatic Co., Inc.
Originators and Manufacturers
***Principal Office:* 50 Church Street, New York**
Philadelphia—Colonial Trust Building Chicago—McCormick Building
Works—Rahway, New Jersey
Manufactured in Canada by Dominion Wheel & Foundry Co., Ltd., Toronto, Ont.





Form 1206A

CLASS OF SERVICE DESIRED	
Telegram	XXX
Day Letter	
Night Message	
Night Letter	

Patrons should mark an X opposite the class of service desired; OTHERWISE THE MESSAGE WILL BE TRANSMITTED AS A FULL-RATE TELEGRAM

WESTERN UNION TELEGRAM

NEWCOMB CARLTON, PRESIDENT GEORGE W. E. ATKINS, FIRST VICE-PRESIDENT

Receiver's No.

Check

Time Filed 10:44 A. M.

Send the following message, subject to the terms on back hereof, which are hereby agreed to

CLEVELAND, OHIO, MARCH 22ND, 1924.

TO ANY GENERAL MANAGER, OR CHIEF ENGINEER,
WHO HAS PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR.

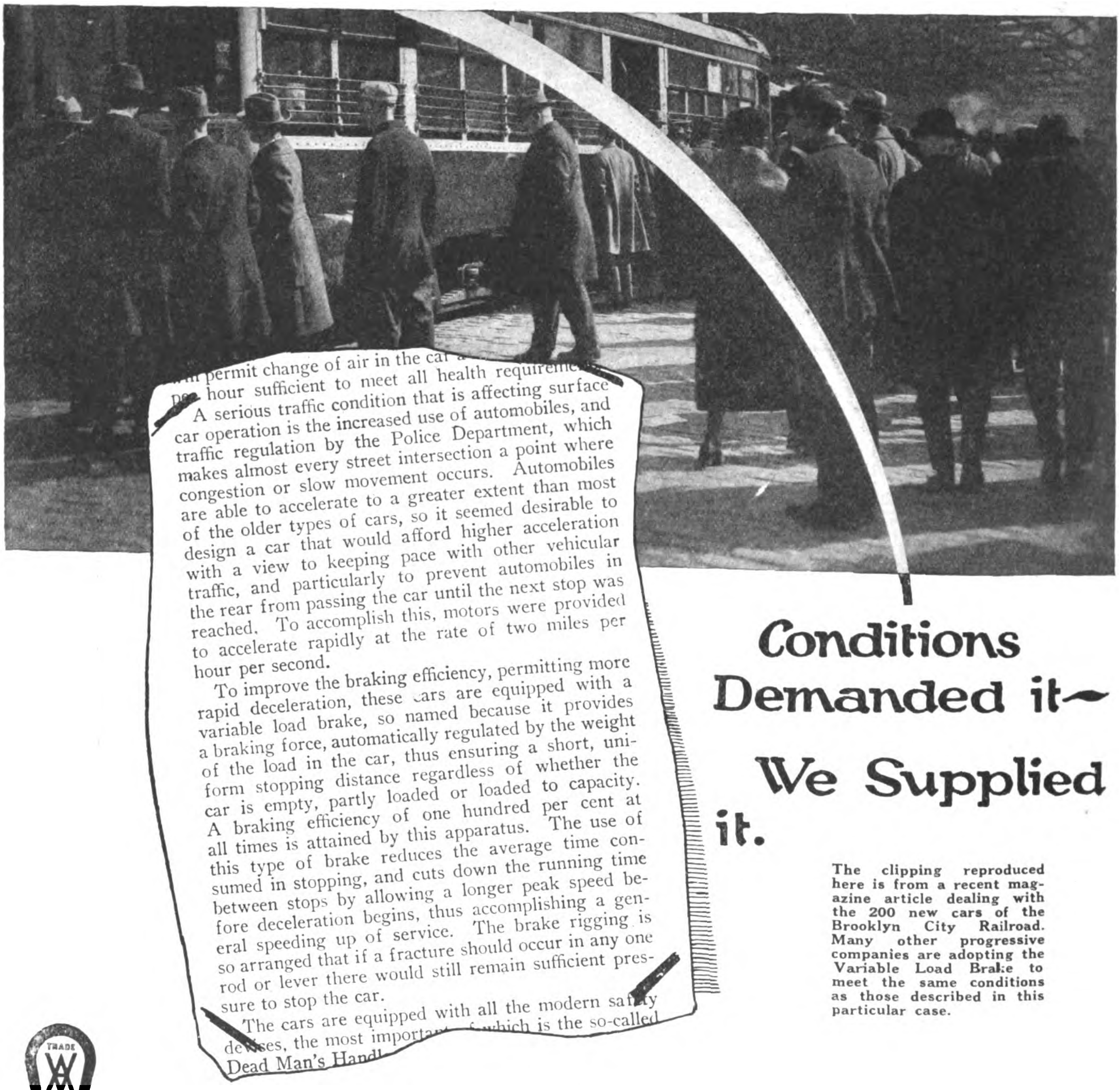
IF YOU HAVE PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR, OR RECONSTRUCT, ALLOW US TO PRESENT COMPLETE METHOD OF SAVING PRESENT CONCRETE FOUNDATION. USED IN CLEVELAND, BALTIMORE, AKRON, DES MOINES, ASHTABULA AND TOLEDO AT SAVING FROM TWO (2) TO SIX (6) DOLLARS PER FOOT TRACK. WIRE ANSWER COLLECT.

THE INTERNATIONAL STEEL TIE COMPANY.

TJL-JLH.

Steel Twin Tie Track

WESTINGHOUSE "VARIABLE LOAD" BRAKE



permit change of air in the ca
hour sufficient to meet all health requireme

A serious traffic condition that is affecting surface car operation is the increased use of automobiles, and traffic regulation by the Police Department, which makes almost every street intersection a point where congestion or slow movement occurs. Automobiles are able to accelerate to a greater extent than most of the older types of cars, so it seemed desirable to design a car that would afford higher acceleration with a view to keeping pace with other vehicular traffic, and particularly to prevent automobiles in the rear from passing the car until the next stop was reached. To accomplish this, motors were provided to accelerate rapidly at the rate of two miles per hour per second.

To improve the braking efficiency, permitting more rapid deceleration, these cars are equipped with a variable load brake, so named because it provides a braking force, automatically regulated by the weight of the load in the car, thus ensuring a short, uniform stopping distance regardless of whether the car is empty, partly loaded or loaded to capacity. A braking efficiency of one hundred per cent at all times is attained by this apparatus. The use of this type of brake reduces the average time consumed in stopping, and cuts down the running time between stops by allowing a longer peak speed before deceleration begins, thus accomplishing a general speeding up of service. The brake rigging is so arranged that if a fracture should occur in any one rod or lever there would still remain sufficient pressure to stop the car.

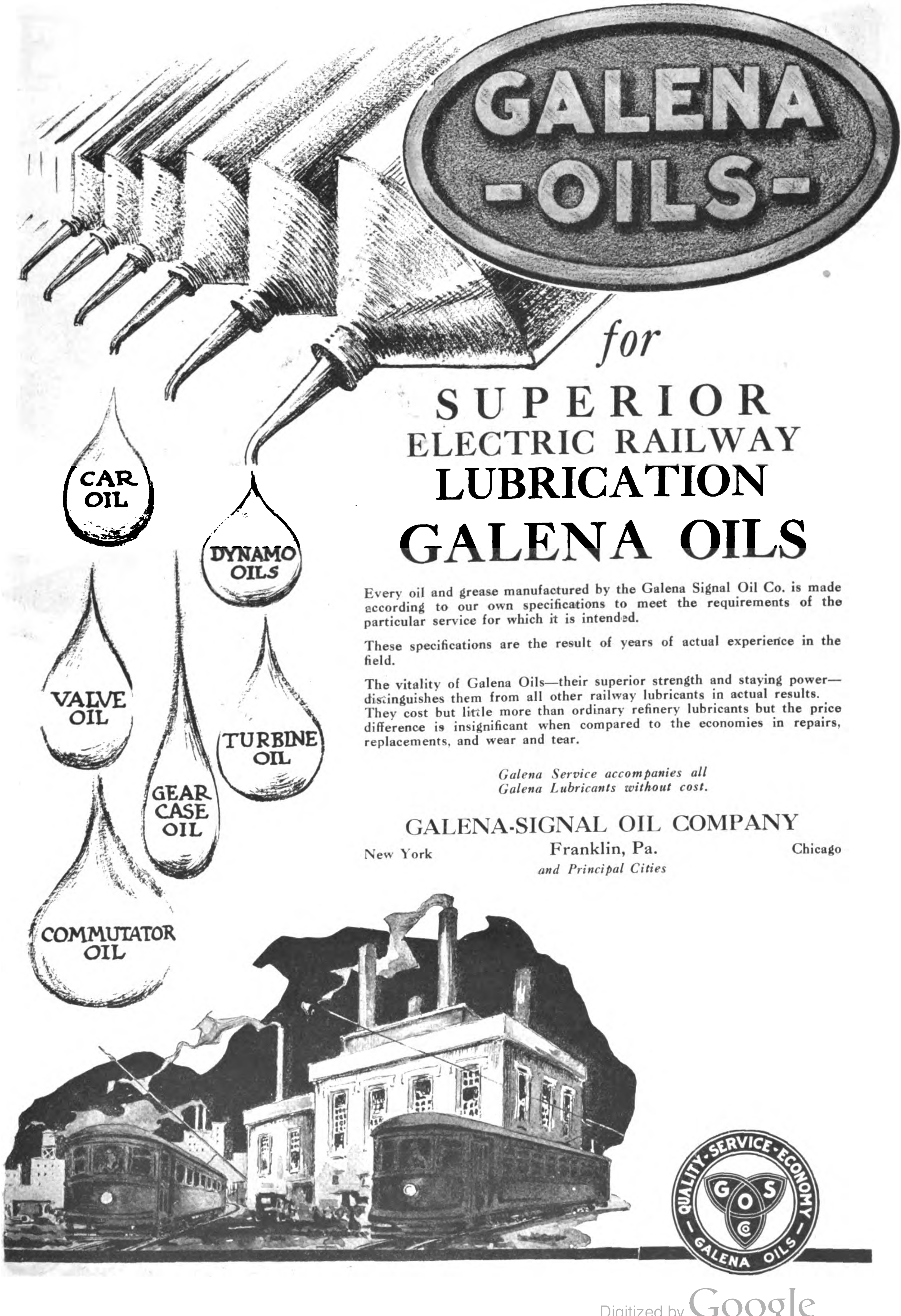
The cars are equipped with all the modern safety devices, the most importa which is the so-called Dead Man's Handl

Conditions Demanded it—We Supplied it.

The clipping reproduced here is from a recent magazine article dealing with the 200 new cars of the Brooklyn City Railroad. Many other progressive companies are adopting the Variable Load Brake to meet the same conditions as those described in this particular case.

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES


GALENA
-OILS-
for
CAR OIL
DYNAMO OILS
VALVE OIL
TURBINE OIL
GEAR CASE OIL
COMMUTATOR OIL
QUALITY·SERVICE·ECONOMY
G O S
GALENA OILS

SUPERIOR ELECTRIC RAILWAY LUBRICATION

GALENA OILS

Every oil and grease manufactured by the Galena Signal Oil Co. is made according to our own specifications to meet the requirements of the particular service for which it is intended.

These specifications are the result of years of actual experience in the field.

The vitality of Galena Oils—their superior strength and staying power—distinguishes them from all other railway lubricants in actual results. They cost but little more than ordinary refinery lubricants but the price difference is insignificant when compared to the economies in repairs, replacements, and wear and tear.

Galena Service accompanies all
Galena Lubricants without cost.

GALENA-SIGNAL OIL COMPANY
New York Franklin, Pa. Chicago
and Principal Cities

ENGINEERING DATA FOR CAR EQUIPMENT MAINTENANCE
GENERAL ELECTRIC COMPANY
RAILWAY SUPPLIES
NERAL ELECTRIC COMPANY
SCHENECTADY N.Y.
VAL PARTS FOR
QUIPMENT
GENERAL ELECTRIC COMPANY

A Complete Service

For years the General Electric Company has encouraged high standards for railway apparatus and supplies. It has persistently emphasized the wisdom of maintaining good equipment with supply parts equally as good. It has spared no effort in guiding electric railways in the selection of modern equipment; in giving helpful suggestions on proper operation and maintenance; and in facilitating maintenance by supplying duplicate parts to perpetuate the quality built originally into equipment—a complete, permanent service to the industry.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-342

GENERAL ELECTRIC

New York, March 29, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

Henry W. Blake and Harry L. Brown, *Editors*

Volume 63
Number 13

Good Records Make for Better Transportation Employees

A COMPLETE system of records of individual employees, such as that used by the Chicago Surface Lines in its transportation department, and described in this issue, requires considerable effort and co-operation on the part of the various other departments to make it efficient and valuable. But with this co-operation, the value of such records is indeed great, as is evidenced in part by the marked improvement in conditions in the transportation department of this company.

Up-to-date records filed in such a manner as to be readily available at any time serve as a guide to the supervisory force when employing, disciplining or dismissing a man. With details of the employee's service record before him, unprejudiced judgment may be given by the one rendering a decision. From the employee's point of view, the knowledge that complete records are kept of every detail of his service life prompts the conscientious man to do better and offers a means of bringing to light his qualifications for advancement.

Elimination of undesirables from among the applicants is greatly facilitated by records of all men who have ever served the company. Nearly always the "ringer" will return for employment, often under an assumed name, and it is only through a complete system of records which includes photographs that he is detected.

It is with a view toward employing and keeping desirable men in the train service that the records of the Chicago Surface Lines are maintained. Their effectiveness is apparent to one who takes note of the quality of platform men now seen on the surface cars in Chicago.

Sincerity Should Be the Keynote of Relations with Employees

THE problem of good relations between management and men is no less important today than it has been in the past, but the development of a friendly spirit is being more and more left to natural growth instead of being forced. This is a good thing in every way.

As a matter of fact the whole plan of improving employee relationship by a kind of beneficient paternalism was based on a false theory. It never had much chance of being successful with men of average intelligence. What the employees want is plain, straightforward and fair dealings. If that is the attitude of the management the slap-on-the-back and the too hearty appearance of friendliness are unnecessary. The spirit is recognized by the action. If that is not the attitude of the management no amount of soft words will secure real co-operation from the men.

It is desirable, when opportunity offers, for the railways to provide reasonable comforts for the men and opportunities for recreation at the carhouses and repair shops. Such things the employees cannot well provide for themselves and they serve to make working conditions more attractive. They have, therefore, genuine value and usually are appreciated.

But to think that good will can be bought by a comparatively small expenditure of this sort without real mutual confidence and understanding betrays ignorance of human nature. That more and more railway executives are conducting their relations with the men on the basis of outspoken frankness—saying what they mean and meaning what they say—is an encouraging indication for the future.

St. Louis Planning to Start Anew

RECENT news indicates the prospect of an early removal of the United Railways of St. Louis from the direction of the federal courts. As one step toward straightening out the local railway situation, the receiver of the company, subject to the instructions of the court, has indicated that as promptness in reorganizing the company is desirable he is prepared to accept the $53,620,059 valuation of the company's property fixed by the State public utilities commission and drop the litigation seeking an increase in that figure. The valuation thus set was fixed on June 4, 1923, and was for the property as of Jan. 1, 1919. Since then capital expenditures amounting to $4,039,054 have been made.

The commission had overruled requests of both the company and the city for a rehearing of the valuation finding. Both the city and the company then sought court intervention. The company claimed a valuation of approximately $70,000,000. The city sought to have the valuation figure fixed at $29,805,975. The commission very distinctly said at the time its decision was rendered that no reduction in fares would be justified until operating conditions had improved by increased revenue or decreased operating expenses. As the net income for 1923, under the present 7-cent fare, was only $809,745, there would appear to be little prospect for a change in the fare in the near future.

The $53,620,059 valuation on which agreement was reached covers amply the present bonded indebtedness of $50,690,000, but following the bonds are $16,383,000 of 5 per cent cumulative preferred stock, on which no dividends have been paid since 1910, and $24,918,000 of common stock, a total of $41,296,000 of junior securities. Theoretically the stockholders would appear to be entitled to share in the future of the company only to the extent of the difference between $53,620,059 and $50,690,000 of indebtedness, plus $4,039,054 put back into the property since the date of the valuation, or

$6,969,113. On the other hand an 8 per cent permissible return on $57,659,113 of capital value would provide, if earned, $4,612,729, as compared with interest requirements last year of only $2,913,614. These figures are of course hypothetical. Many other things remain to be settled in which the city is equally interested with the company, among them the mill tax and the working out of an arrangement which will provide a plan for the co-ordination of transportation facilities in the future.

As for the former owners of the property, the extent to which they will be permitted to participate in the terms of the reorganization remains to be seen, but the case for them, while it does appear bad, is not so hopeless as it might appear from the bald valuation figures. The hope of the stockholders lies principally in the spread between the interest rate and the permissible return, and on the prospect for economies resulting from the money already put back into the property and that may in the future be put back.

So the St. Louis news is good news, even to the stockholders. It may be followed by the announcement of an Irishman's dividend, but for the stockholders almost any arrangement would seem to be preferable to the present one, under which there is neither profit for them nor participation in the management of the company.

Detroit Finds Its Railway Purchase Plan Unworkable at Low Fare

DETROIT is finding it difficult to pay for the system of the Detroit United Railway out of earnings and at the same time function as a going concern. Of the total purchase price there remains an indebtedness of $15,000,000 to be taken up during the next nine years. As one of the local papers puts it, there is no doubt in the minds of practically all city officials that a new financing scheme is essential to the success of the Detroit municipal railway. At present the city must meet, out of current earnings of the railway, all expenses, pay semi-annually $500,000 on the purchase price in addition to interest, and accumulate a reserve with which to make the final payment of $7,580,000 in 1933. On the unpaid balance of the purchase debt the city is required to pay 6 per cent interest.

With the need for expansion ever present the city is apparently finding it increasingly difficult to carry on successfully and keep pace with current needs. Fares have already been boosted once. The hope is expressed that the city may be able to arrange a loan, possibly through Henry Ford, covering the unpaid balance of the purchase price of the private undertaking which it took over, this new bond to run for twenty years at a rate of interest considerably less than is called for under the present terms. It would seem that sooner or later resort must be had to some such plan if fares are not to go still higher.

The measure of success which may attend the city's attempt thus to solve its problem remains to be seen. The optimists who conceived and put across the purchase at Detroit had of course hoped to amortize the cost of the purchase out of earnings in fifteen years, but it appears there were a number of practical considerations that did not enter into their calculations. To say that this is usually the case does not make it any the easier for those who are being called upon now to grapple with the problem.

Regulation for the Bus Is Inescapable

MANAGERS of steam and electric railways in Oklahoma view with alarm the failure of the recent session of the Legislature there to impose any measure of regulation on buses and trucks similar to that under which they are compelled to operate. And well they may. But the advocates of the policy of a free field for the buses have won only a temporary victory. Everywhere the tendency is toward regulation, for it is obviously unreasonable to restrict and tax the railway while letting its competitor continue operating free of virtually all obligation.

The very things that the bus operators of Oklahoma hope to enjoy brought about regulation of transportation in the first place. Already some twenty-five states exercise supervision over bus operation. That supervision extends from control over routes, through the establishment of rates and fares to the examination of accounts and records, to mention just a few things. Unless the operator intending to engage in the bus business is prepared eventually to accept regulation similar to that imposed on other common carriers he had better not enter the field. It is only as a temporary respite that he is free from road-use fees and other obligations which other carriers must meet. Regulation is inescapable. It is bound to come. The iniquities that will grow up under the present system in Oklahoma will eventually drive the state to regulation as a matter of self-defense. In thus standing out at this time against the tendency of the day Oklahoma by its lethargy or indifference will be called upon in the future to pay the price that unfair discrimination always imposes on the users of a service.

Need More Publicity Men as Managers

FEW men have a "nose for news." This holds true for men of all professions, and surely it applies to most general managers of traction companies. Nowadays, in view of the great importance placed on publicity work, perhaps we need more publicity men in the position of manager; that is, we need managers who also have a good sense of what makes readable and worth-while publicity.

If a good newspaper man were sitting in on all the things that pass over the general manager's desk, he would find all kinds of "great stuff" there for publication in the newspapers. Yet few executives see the public interest in the things they pass upon. Particularly do they miss the publicity value of the routine reports of operation. These contain much that would make newspaper copy.

For example, why not tell of the quick work of the wrecking crew in removing a broken-down truck? Why not tell of the skill and quick thinking of the motorman which averted a bad accident—rather than to tell only of the accidents? Why not, in short, tell of the good things the company has accomplished that are evident on every hand to those familiar with it?

A good way to get more of such matter before the public would be to route more routine company business over the publicity man's desk. Or give the publicity man a desk in the G. M.'s office. One of the most successful executives in the country, in point of public relations, has his secretary as his publicity man.

Records Facilitate Transportation Department Management

Co-operation of All Branches of Transportation Department, Together with Adequate Forms and Filing System, Gives the Chicago Surface Lines Accurate, Available Employee Records—Forms Are Result of Twenty Years' Development

CAREFUL development by the Chicago Surface Lines over a period of twenty years has resulted in a system of collecting, compiling and filing the "live" records of more than 12,000 trainmen and the "dead" records of all men who have left the service since 1914, which greatly expedites the management of the transportation department. These records are designed for a threefold purpose: First, to record promptly all infractions of rules and to call the man's attention to such infractions promptly, so as to enable the supervisory force to offer constructive criticism and advice before the infraction is repeated; second, to build up a running history of the character and efficiency of each employee, as a guide for promotion; third, to give the heads of the department accurate and quickly available records to aid in judging the man when disciplinary action seems necessary.

THE FORMS ARE DESIGNED FOR SIMPLICITY

The printed forms are designed with a view toward avoiding red tape. A portion of the time of nine clerks and two stenographers in the transportation department is used to maintain these records so that they are always up to date and quickly available when required. This is possible since each has a definite part of the work to perform.

The system used may be termed a "one-file" system; that is, all of the records pertaining to the employee's service life, together with manuscripts substantiating these records, are filed together in a large manila envelope known as a "jacket." After an application for employment has been accepted, it is sent to the transportation department office, together with all forms which the applicant may fill out during the employment and instruction period, where these records are filed in the "jacket." Termination of his service by no means terminates the record of the man. It is kept on indefinitely as an aid to this company or to any other company desiring information on the man's ability or character. To insure the accuracy of the record, the complete co-operation of all branches of the department, both at the main office and at the twelve outlying division offices, is essential.

When the application blank is filled out at the employment office the applicant begins his relationship with the company. A careful investigation of his former record is made by the employment division of the transportation department. Many interesting irregularities and discrepancies are thus divulged, and in case of doubt as to the validity of replies to reference questionnaires, letters are sent to prominent citizens such as the postmaster or president of a bank in the town which the applicant refers to as his home. This procedure has frequently eliminated "ringers" who make a practice of "floating" from one property to another.

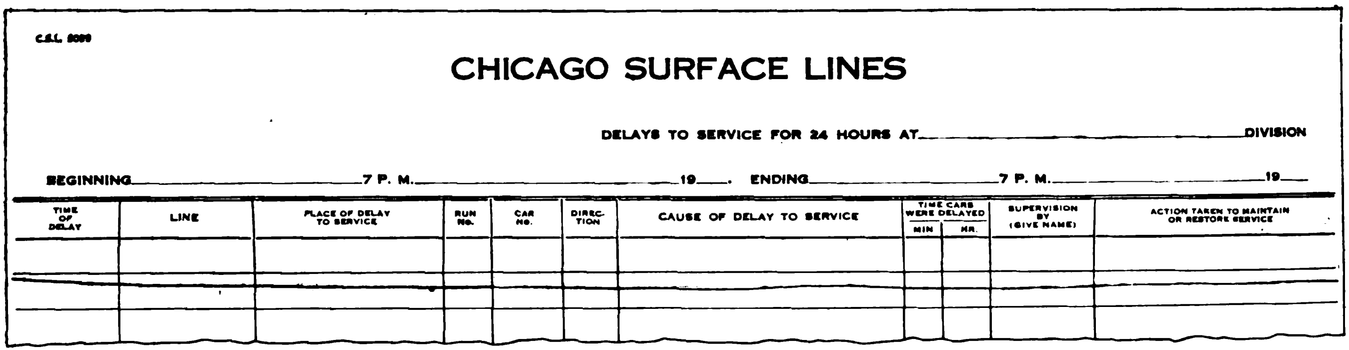
If the applicant's record is found favorable he is notified by a call letter to report back to the employment office and is sent to the doctor, who makes an examination and fills out the form designed for the examining physician. From the doctor to the transportation department office, and then back to the employment manager, is the route taken by the successful applicant before he finally signs his contract and is furnished with a badge and other credentials. A deposit is taken from the applicant for his badge and uniform. Orders signed by the employment manager give him the right to be measured for his uniform, to have his photograph taken, and to enter the school of instruction.

At this school he is given preliminary instruction for one day, after which an assignment is made for a "student run" on a division as near his residence as possible. Under the instructions of able employees the student takes up a fourteen-day run, for which he receives no pay. Following the successful passage of an examination at the school of instruction after his student period the new employee is sent back to the employment manager for final instructions. The superintendent of transportation makes it a point to interview all new employees personally, either singly or in groups, at this stage in their training. Permanent assignment to a carhouse is then made and the man's name is placed on the "extra" list.

Up to the point of signing the contract, all forms and records which have been made out are kept at the employment office. When the applicant becomes an employee, which is marked by his signing the contract with the company, and which establishes his seniority, these records are transferred to the transportation department, where they are placed in the "jacket" and filed numerically by badge number in the company's "live record file." This includes the application blank, reference replies, medical examination, and contract with the company. At the same time a notice is sent by the employment department to all department heads containing information relative to the men who have signed contracts on that day.

ALL FORMS FILED IN INDIVIDUAL "JACKETS"

The "jacket," previously referred to, which holds the forms while they are in the possession of the transportation department, is of ample size to accommodate all letters or other data. On the outside are rulings for notations of badge number changes, or transfers from one depot to another. It is also in this space that notation is made of the reason for leaving the service, such as discharge, decease, or resignation. At the time the "jackets" are filed, two cards are made out on which are recorded the man's name, conductor or motorman, depot, date of employment, date of final instructions, and badge number or badge number change. These are filed, one numerically by badge number and the other alphabetically, in the "live card index." A yellow card is used for motormen and a white one for conductors, and odd badge numbers are assigned to the former, while the latter are given even badge numbers. Although the "jackets" are filed numerically without reference to the man's work, the cards are segregated into a conductors' and a motormen's file. These cards serve as a cross index on the "jacket" file and also aid in locating the new badge number of a man whose badge has been changed at any time. Given the employee's badge or name, it is possible to establish definitely his identity and to procure quickly all records pertaining to his service.



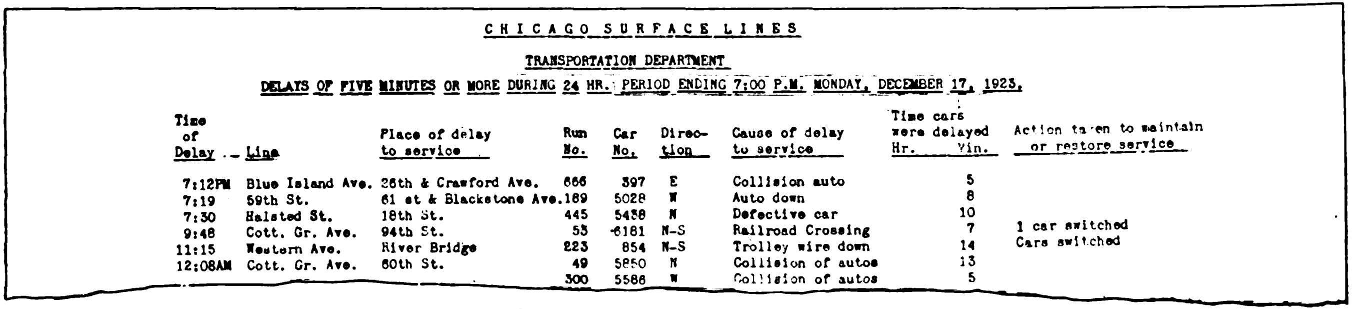
C.S.L. 8089

CHICAGO SURFACE LINES

DELAYS TO SERVICE FOR 24 HOURS AT ______ DIVISION

BEGINNING ______ 7 P. M. ______ 19___. ENDING ______ 7 P. M. ______ 19___

TIME OF DELAY	LINE	PLACE OF DELAY TO SERVICE	RUN NO.	CAR NO.	DIREC-TION	CAUSE OF DELAY TO SERVICE	TIME CARS WERE DELAYED		SUPERVISION BY (GIVE NAME)	ACTION TAKEN TO MAINTAIN OR RESTORE SERVICE
							MIN	HR.		

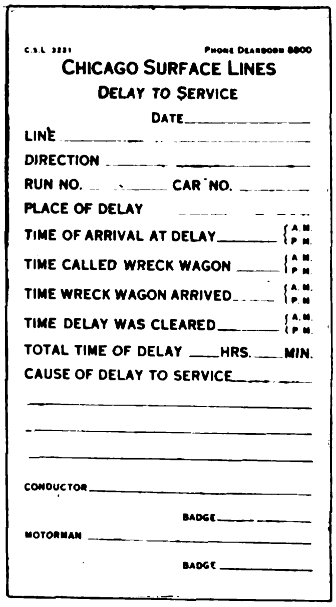


CHICAGO SURFACE LINES

TRANSPORTATION DEPARTMENT

DELAYS OF FIVE MINUTES OR MORE DURING 24 HR. PERIOD ENDING 7:00 P.M. MONDAY, DECEMBER 17, 1923.

Time of Delay	Line	Place of delay to service	Run No.	Car No.	Direc-tion	Cause of delay to service	Time cars were delayed		Action taken to maintain or restore service
							Hr.	Min.	
7:12PM	Blue Island Ave.	26th & Crawford Ave.	666	397	E	Collision auto		5	
7:19	59th St.	61 st & Blackstone Ave.	189	5028	W	Auto down		8	
7:30	Halsted St.	18th St.	445	5458	N	Defective car		10	
9:48	Cott. Gr. Ave.	94th St.	53	6181	N-S	Railroad Crossing		7	1 car switched
11:15	Western Ave.	River Bridge	223	854	N-S	Trolley wire down		14	Cars switched
12:08AM	Cott. Gr. Ave.	60th St.	49	5850	N	Collision of autos		13	
			300	5586	W	Collision of autos		5	



C.S.L. 3231 PHONE DEARBORN 8800

CHICAGO SURFACE LINES

DELAY TO SERVICE

DATE ______

LINE ______

DIRECTION ______

RUN NO. ______ CAR NO. ______

PLACE OF DELAY ______

TIME OF ARRIVAL AT DELAY ______ {A.M. P.M.

TIME CALLED WRECK WAGON ______ {A.M. P.M.

TIME WRECK WAGON ARRIVED ______ {A.M. P.M.

TIME DELAY WAS CLEARED ______ {A.M. P.M.

TOTAL TIME OF DELAY ___HRS. ___MIN.

CAUSE OF DELAY TO SERVICE ______

CONDUCTOR ______

BADGE ______

MOTORMAN ______

BADGE ______

Forms Used in Compiling Delay Report. Delay Card Is Filled In by Conductor on Lead Car at Point of Delay

To systematize the recording of incidents in the employee's service life and the disciplinary action taken by the division superintendents, a record sheet of such size as to fit conveniently into the "jacket" is made out for each current year by the clerk at the division superintendent's office. This, and an inspection record card, are the only two pieces of current manuscript pertaining to the employee which are not at all times kept in the vault of the transportation department.

At the end of each year, however, these records are sent to the transportation department office for filing in the "jacket" of the man. In the case of dismissal, the current record sheets are immediately sent to the transportation department and are promptly placed with the rest of his record, so as to be available at the time he is interviewed by the superintendent. Upon the employee terminating his relationship with the company, the "jacket" is filed alphabetically by years under the year in which he left the service, and cards are filed both alphabetically and by badge number in the dead file.

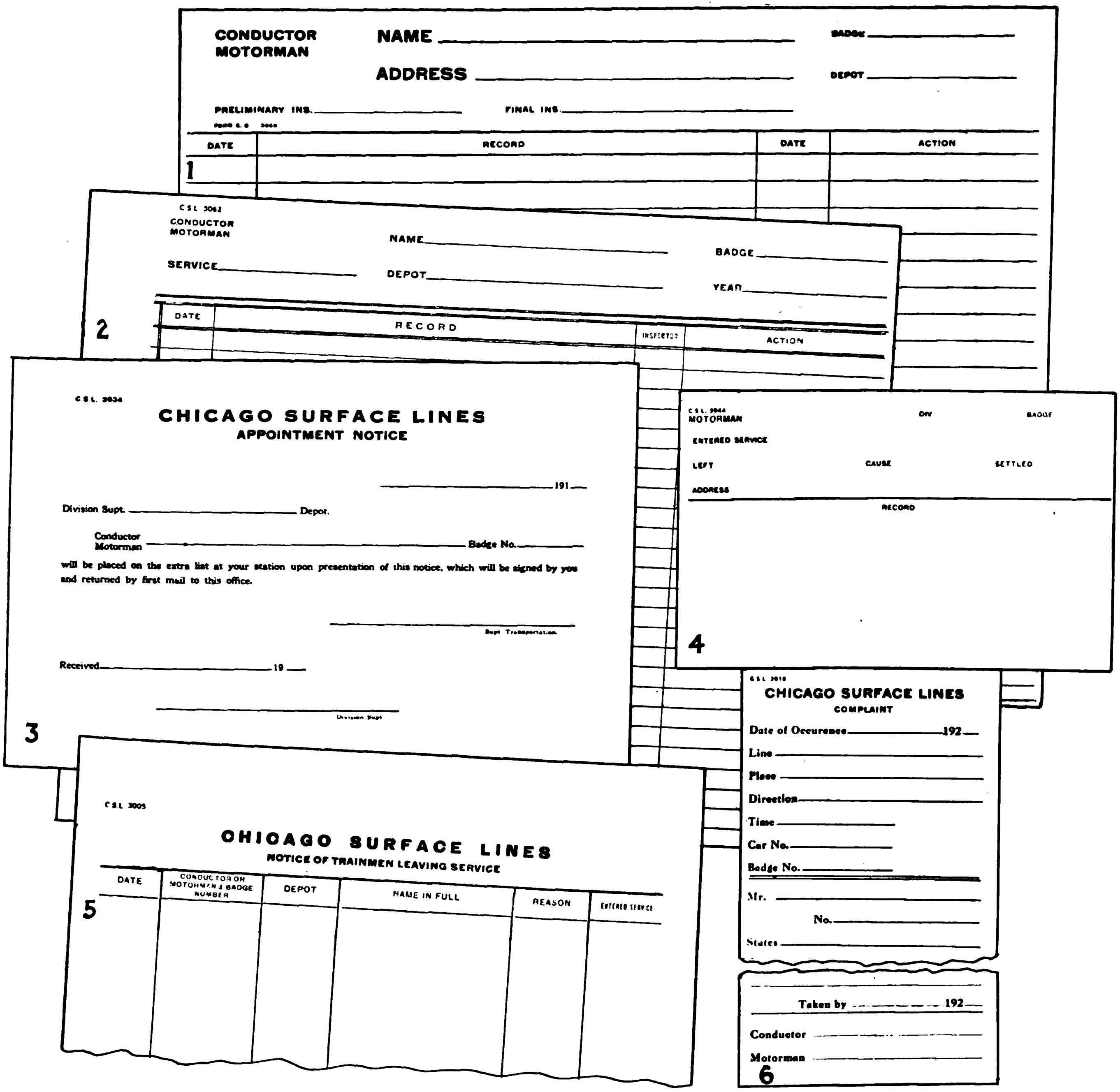
The outside of the jacket carries a notation of the man's settlement with the company. The customary procedure requires the man to turn in his badge and paraphernalia and receive his deposit, or that portion to which he is entitled. Some men prefer to retain their badges in lieu of receiving their pay and deposit. Where such is the case the auditing department attempts to force a settlement so as to have the badge returned. A daily notice similar to the employment notice is sent around to all division offices, indicating the number of men who have left the service by their badge numbers, names, and reasons for leaving.

Careful attention is given to all complaints received from patrons. A great majority of these are received through the mails, but some are transmitted by telephone or personal call. When a complaint is received from any one outside the company, no matter in what form it may have been delivered, a complaint form or blank is made out by the transportation department clerk who receives the information. This gives the location of the car, badge number of conductor and motorman, and details pertaining to the incident. The regular supervisors also transmit complaints relative to infractions of the rules. The form, together with the letter, if the information is received by mail, is sent to the executive department, where a reply is written thanking the writer for his co-operation. The complaint form is then forwarded, for disciplinary action, to the superintendent of the division in which the accused man operates. After the incident has been investigated, the form is returned to the transportation department office with the action noted thereon and is filed with the man's record. When a supervisor or inspector makes a report of a breach of rules, a similar complaint form is filled out and is sent directly to the division superintendent's office for action, after which it is returned to the transportation department to be filed in the "jacket."

The field supervisory forces of the department consist of supervisors, traveling conductors and traveling motormen, operating out of each carhouse. Their duty is to foresee and correct defects in service on the street. In cases of trouble such as an interruption of service or difficulty between a patron and trainman, they act as the direct representative of the division superintendent and make every effort to handle the case on the job so that the situation may be cleared up with promptness and to the satisfaction of the passengers.

The supervisor is a street man, and his primary duty is to keep traffic moving. The traveling motormen and traveling conductors, while they wear the badges of supervisors, are really traveling instructors and are selected for their personality and ability to correct errors in trainmen while on duty. It is part of the duty of these men to instill in the new motorman or conductor that confidence which is so often lacking in the new man who has recently completed a course of instruction. When necessary the new man is shown how to feed the power, apply the brakes, and in case of a conductor, to handle fares rapidly and to be courteous to passengers. There are a total of ninety-six supervisors, of which number twenty-four, or two out of each division, are classed as traveling motormen and conductors.

A man's ability as an operator is largely judged on the basis of accidents in which he figures as a responsible party. A form covering the usual data on the car, location, and time of day, together with the con-



1

CONDUCTOR
MOTORMAN
NAME ____ BADGE ____
ADDRESS ____ DEPOT ____
PRELIMINARY INS. ____ FINAL INS. ____

DATE	RECORD	DATE	ACTION

2

C S L 3062
CONDUCTOR
MOTORMAN
NAME ____ BADGE ____
SERVICE ____ DEPOT ____ YEAR ____

DATE	RECORD	INSPECTOR	ACTION

3

C.S.L. 3034

CHICAGO SURFACE LINES
APPOINTMENT NOTICE

____ 191__

Division Supt. ____ Depot.

Conductor
Motorman ____ Badge No. ____

will be placed on the extra list at your station upon presentation of this notice, which will be signed by you and returned by first mail to this office.

____
Supt. Transportation.

Received ____ 19__

____
Division Supt.

4

C S L 3044
MOTORMAN DIV BADGE
ENTERED SERVICE
LEFT CAUSE SETTLED
ADDRESS
RECORD

5

C S L 3005

CHICAGO SURFACE LINES
NOTICE OF TRAINMEN LEAVING SERVICE

DATE	CONDUCTOR OR MOTORMAN'S BADGE NUMBER	DEPOT	NAME IN FULL	REASON	ENTERED SERVICE

6

C S L 3018

CHICAGO SURFACE LINES
COMPLAINT

Date of Occurence ____ 192__
Line ____
Place ____
Direction ____
Time ____
Car No. ____
Badge No. ____
Mr. ____
No. ____
States ____

Taken by ____ 192__
Conductor ____
Motorman ____

Group of Forms Used by Transportation Department for Keeping Records of Trainmen

No. 1. Manila "jacket" which holds manuscript in file.

No. 2. Record sheet kept at division headquarters for current year, then filed in main office jacket.

No. 3. Appointment notice sent to all division superintendents at the time assignment is made.

No. 4. Card record form used in cross index on jacket file. The one for motorman is shown, that for conductor being exactly similar.

No. 5. Departmental notice of trainmen leaving service.

No. 6. Complaint form.

ductor or motorman's statement and the names of witnesses, is made out by the conductor when reporting any unusual incident in the trip. The men are encouraged to do this work carefully and are paid for time taken to fill out these blanks at the division superintendent's office after their day's work is over. The report is sent directly to the claim department, where a number of copies, known as accident briefs, are made. Two of these are sent to the transportation department office the following morning. Passing through the transportation department, one copy goes to the depot out of which the man is working, and the other remains in the department office for reference.

The division superintendent takes whatever disciplinary action is necessary, notes action taken on accident brief, enters report and action on man's yearly record sheet and sends the brief back to the main office, where it is filed in the man's "jacket." As in the case of other infractions of rules, if the matter is serious enough to warrant dismissal, the general superintendent has the final ruling.

SENIORITY RIGHTS MAINTAINED

An interesting and important function of the transportation department is the compiling and maintaining of the seniority record of all trainmen. A new man's name is placed on the seniority book the morning after his contract notice is sent out by the employment office. A section in the book is devoted to the names of men working out of each depot, and is further subdivided for motormen and conductors. The names of new men are added to the list for the station to which they are assigned, in the same order as they appear on the employment notices. Although a man's name may appear fifth on the employment notice for a given day, he will rank first for that day in the seniority book for that depot, if no one of the preceding four was assigned to the same depot. As men leave the service for one reason or another a line is drawn through their names. A new book is made up each year so that the book for the current year does not contain the names of men leaving service during the previous year.

Seniority rights determine the order of the man's choice of run. A general "pick" is conducted every three months and after the trainmen have made their selection of runs, a list showing the runs picked is sent to the main office, where the validity of a man's claim of rating is checked against the seniority book. As this list also contains the man's badge number, it serves as a quarterly check on the information recorded in the book. A similar list is made up of extra men, with the newest man at the depot occupying the bottom position on the list.

HANDLING DELAYS

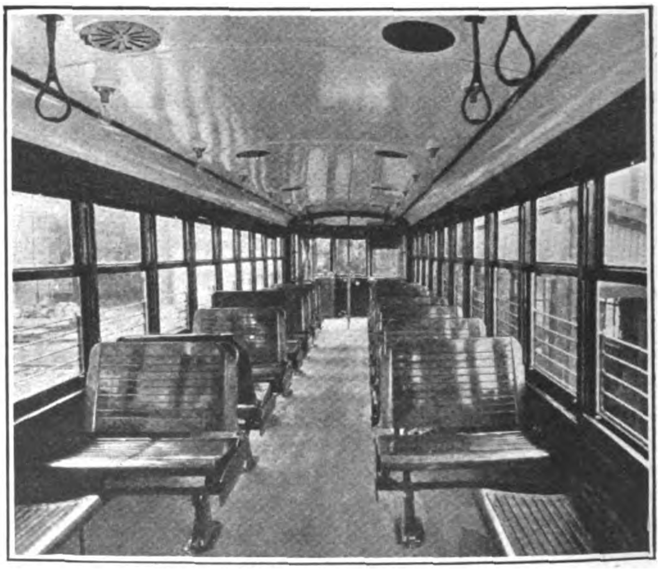
A daily delay sheet is run off on a duplicator each morning by the transportation department, listing the time, place, duration, and cause of every specific delay of five minutes or more occurring between 7 p.m. of the second day preceding and 7 p.m. of the day preceding the day of issue. Copies are sent to heads of departments and executive officers of the company. There are two sources of information from which this general delay sheet is compiled. The first is a smaller sheet which is made up by the clerks at the various division headquarters from information recorded on delay cards made out during the day by trainmen. These sheets are forwarded to the main office for tabulation.

The other source of delay information comes from the dispatcher on duty at the main switchboard. He makes out a report of each delay which requires a wreck wagon. A check on the service rendered by the various departments in time of trouble is made from the time noted on the trainman's delay card. The following blank headings to be filled in by the conductor of the lead car indicate the efficiency of the co-operating departments: Time of arrival at delay, time called wreck wagon, time wreck wagon arrived, time delay was cleared, and total time of delay. An unusually long time elapsing between any two of the above calls for an explanation from the man or department responsible.

Chicago & Joliet One-Man Cars

Double-Truck, 44-Passenger Cars for Suburban Service in Joliet—Low Floor, Maximum Traction Truck, Safety Devices Are Features

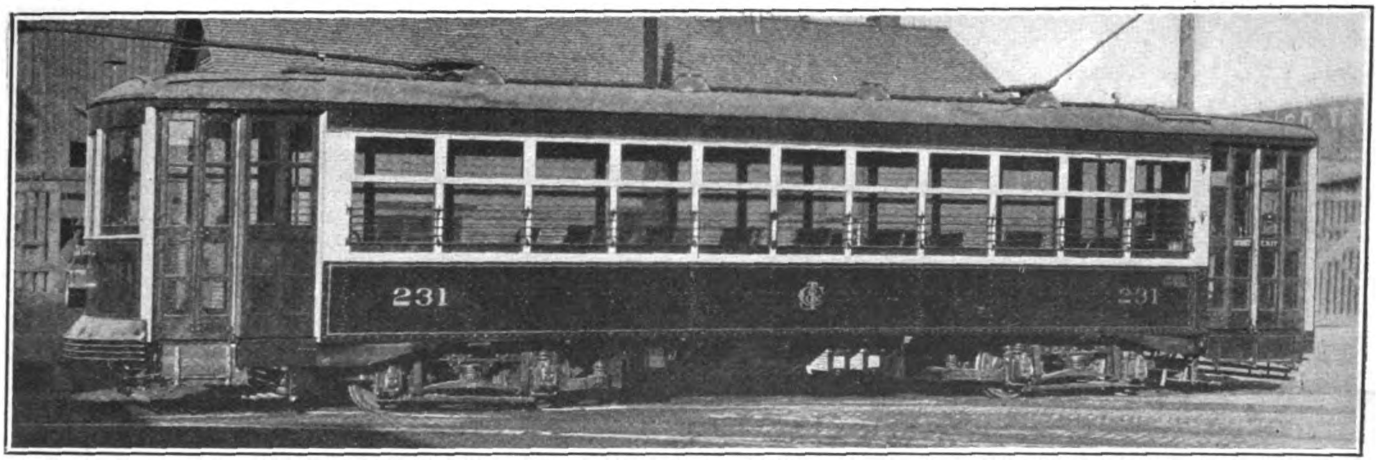
TEN new cars recently built for the Chicago & Joliet Electric Railway, Joliet, Ill., by the G. C. Kuhlman Car Company have been placed in suburban service on the Lockport to Rockdale run, a distance of 6½ miles, the greater part of which is made through the city streets of Joliet. The car is more comfortable than would be a strictly city type car, due to the generous spacing of the seats and the wide windows. The cars are arranged for operation by one man.



The Interior Has White Maple Floor, Mahogany Finished Seats and Trim and White Enamel Headlining

In the design considerable thought was given to the fact that these cars would be used during heavy rush-hour periods when the workers in the wire and steel mills of Rockdale are transported to and from their homes in Lockport and Joliet. Ample provision has been made both in the width of aisle and in the length of platform to accommodate a large standing load.

The car is of the straight side type, with a low arched roof, and drop platforms, mounted on maximum traction trucks. Double folding doors are provided at the right-hand front corners of the car, while a single folding door opposite provides means of egress from the car where an island platform stop makes this arrangement necessary. The side sills are 3-in. x 3-in. x ⅜-in. angles, securely gusseted with 4-in. x 4-in. x ⅝-in. angles to



The Wide Windows and Extended Platforms of the Chicago & Joliet Cars Give a Pleasing Appearance

3-in., 4-lb. channel cross sills which extend the full width of the car body. The outside platform knees consist of 8-in., 15.5-lb. channels extending to the inside of the bumpers. Additional support is given to the platform by means of center knees of 3-in., 4.1-lb. channels. The bolsters are of the built-up type, made with an 8-in. x ⅝-in. top plate and an 8-in. x ¾-in. bottom plate. The body, corner and side posts are of 1½-in. x 1½-in. x 3/16-in. tees. The same material is used for carlines, poplar strips being bolted on each side of the tee for nailing strips for the roof boards and for the Agasote headlining.

The side sheathing of the car consists of 3/32-in. steel, riveted to the side sill and to the side posts. It is secured to the wood body corner post by means of screws and bolts. The belt rail is a flat steel bar, 2½ in. x ⅜ in. It extends the full length of the car body between body corner posts, with a formed sheet steel cover. The seat rest angles are of 1¼-in. x 1¼-in. x ⅛-in. steel, riveted to the side sheathing. A steel letter board riveted to the side posts extends over the top sash frame.

There are eleven side windows. The top sash is stationary and is framed in one continuous piece the length of the car body, while the lower sash is arranged to raise. The side posts are placed on 33-in. centers, allowing a somewhat wider window than that usually found in city cars. Window guards in two sections are provided for each side of the car. The length over bumpers is 44 ft. 10 in. and the width over corner posts is 8 ft. 4 in. The truck centers are 22 ft. apart, and the truck wheelbase is 4 ft. 10 in.

The interior of the car is finished in cherry, with white enamel ceiling. No bulkhead or step separates the platform from the car body. The Agasote headlining is continued into the vestibule and a slight ramp drops the platform level approximately 2 in. Seven Brill reversible cross seats of wood slat construction are spaced opposite the seven middle windows on each side, while a longitudinal seat occupies the space in front of the remaining two windows at each end. There is also a single folding seat on the left side of each platform between the body corner post and the door, making a total of forty-four seats.

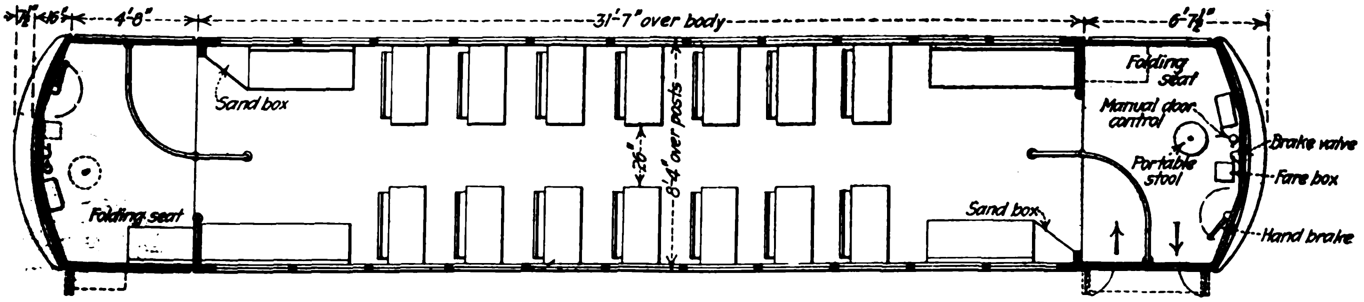
To insure warmth and comfort to the passengers a double flooring has been provided, made up of 13/16-in. hard maple laid upon 13/16-in. pine flooring, with a layer of building felt placed between. The inside sheathing from the floor up to the window rests is of ¼-in. Agasote.

Thermostatically controlled electric heat is provided with twenty single coil truss-plank heaters under the seats. A cab heater is located in each vestibule close to the operator's position. Eight Brill exhaust type ventilators, spaced four on each side of the roof, may be regulated by means of ceiling registers with movable shutters.

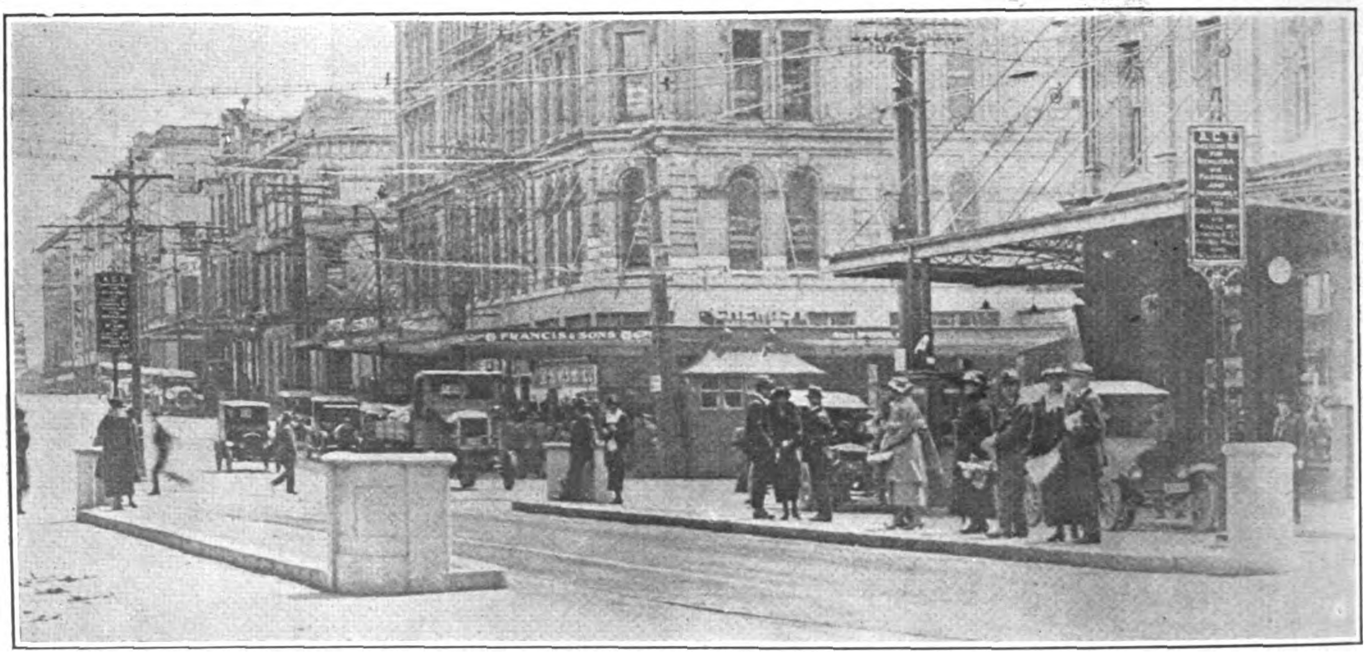
PASSENGERS ENTER AND LEAVE BY SEPARATE DOORS AT THE FRONT END

The two-leaf folding doors on the right side swing outward against the body corner post and vestibule post. They are equipped with National Pneumatic door and folding step mechanism. The single folding door on the left side of the vestibule is hand operated. The cars are operated "Pay-As-You-Leave"; passengers enter through the door adjacent to the car body and leave through the other one. A Johnson fare box is used for fare collection. The car has the standard safety features of the Safety Car Devices Company.

One Westinghouse 535-A, 60-hp. motor is mounted on each of the Brill 39 E-1 maximum traction trucks. The driving wheels are of 28 in. diameter and the pony wheels 22 in. The control is K-35 double end. The Westinghouse air brake equipment is used, including DH-16 compressor.



The Platforms of the Chicago & Joliet Car Is Flush with the Body, Facilitating Passenger Movement



Substantial Waiting Platforms of Concrete Are a Feature of Some of the Downtown Streets in Auckland

Auckland Will Make Extensive Improvements

New Zealand Tramway Carried About 52,000,000 Passengers in 1923 and Has Decided Upon a Development Program to Cover Four Years

DURING the next four years the city of Auckland, New Zealand, will spend £280,000 (approximately $1,260,000) on improvements to its tramway system. This is in addition to £250,000 invested under recent appropriations and to the £1,277,201 paid by the city for the property in July, 1919, when it was taken over from its private owners, the Auckland Electric Tramways Company, Ltd. The new improvements contemplated include extensions of the line, new repair shops, a number of additional cars and ten up-to-date motor buses.

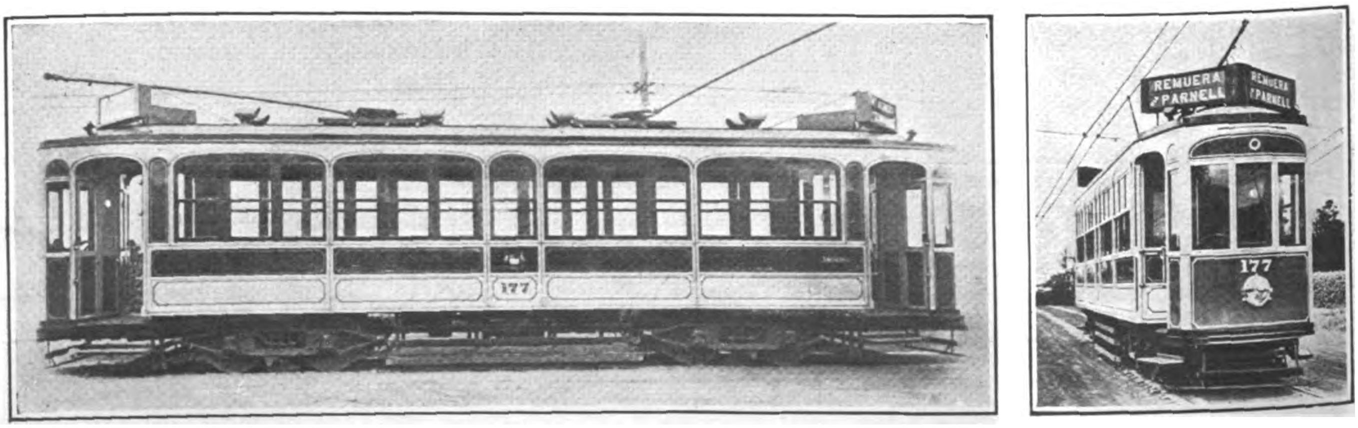
Auckland has a population of about 140,000, and on Jan. 1, 1924, the trolley system comprised 51½ miles of single track, 170 passenger cars and eleven service cars. About 4,300,000 car-miles were run and about 52,000,000 passengers were carried during 1923. This makes the system the largest electric railway property in New Zealand, the total number of passengers carried in Wellington in 1923 being about 37,000,000, in Christ Church 25,000,000 and in Dunedin 20,000,000.

The zone system of fares is used, the zones being about 1 mile in length. Weekly tickets, available over six sections, are issued for 3s. 9d., and in some cases return tickets are used, as, for instance, an ordinary fare for six sections is 7d. each way, but a return ticket is issued for 11d.

Accompanying illustrations show the standard car used as well as a typical view downtown, with a concrete waiting platform, of which there are a number on the Auckland system.

One striking feature of the car is the window arrangement, made up in what might be called in this country an exaggerated empire style. A close inspection of the photograph will show that each of the two openings at each end of the car actually is divided into three upper and three lower sash. Other features of the car are a completely inclosed motorman's cab, the elaborate lining of the panels, the side safety guard between the trucks, the anti-climber and the very conspicuous route sign at each end of the car.

A. E. Ford, general manager Auckland Municipal Tramways, was formerly traffic superintendent of the Adelaide Municipal Tramway Trust, and began his tramway career in the service of the Sydney tramways.



The Auckland Standard Car Has a Peculiar Arrangement of Sash, Inclosed Motorman's Compartment and Conspicuous Route Signs on Roof

Making Tests to Save $15,000,000 a Year

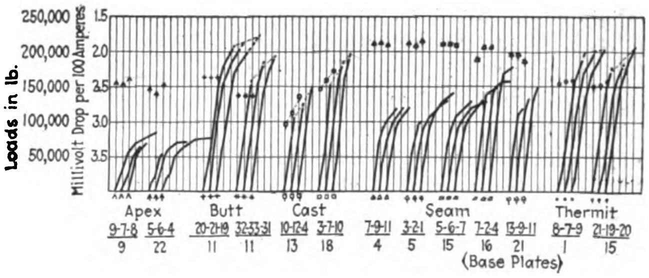
A Joint Capable of Developing the Full Life of the Rail Would Greatly Reduce Track Reconstruction Expenditures—Results of Numerous Tensile, Bending and Drop Tests Are Given

THERE are something over 25,000 miles of urban electric railway track in this country. At $60,000 a mile this represents an investment of $1,500,000,000, and on the assumption that this track has to be reconstructed on an average once in 20 years, there is an expenditure of $75,000,000 per year. If it be assumed that track built with welded rail joints capable of developing the full life of the rails would have an average life of 25 years, the corresponding annual expenditure for track reconstruction would be $60,000,000 per year. The difference would constitute a saving of $15,000,000 per annum.

In order to discover a way in which such a saving can be accomplished a committee representing the American Electric Railway Association and the American Bureau of Welding has conducted an extensive series of tensile, bending and drop tests. It is planned to make also a series of repeated impact tests and some sort of service test, but the method of making the latter has not yet been definitely decided upon.

The Emery tensile machine of the United States Bureau of Standards is being moved from one building to another and it will not be possible to complete the series of tensile tests for two or three months. The impact testing machine designed and built especially for the committee has been constructed and is now being erected in Washington. As soon as these two machines are available all the tests can be completed which are contemplated in the preliminary program of determining the state of the art. It was thought undesirable to attempt to pass judgment on the relative service value of the different joints tested until after service tests have been made. However, the results given by the conductivity, tensile, drop and bending tests are so clearly shown that the engineers of electric railway companies will find in them valuable information for their guidance.

A standard method was followed by engineers of various railways in making test joints on special rail in order to have the work done under conditions approximating normal track methods as closely as possible. Two 33-ft. 6-in. rails furnished by steel companies for the purpose of making test welds were laid end to end in existing track after removal of existing rail and 15 in. of pavement each side of the rail down to the top of the ties. This was to insure that conditions for the workmen making welds were normal and that the temperature conditions were normal, including the ability of the adjoining rail to conduct heat and electric current.

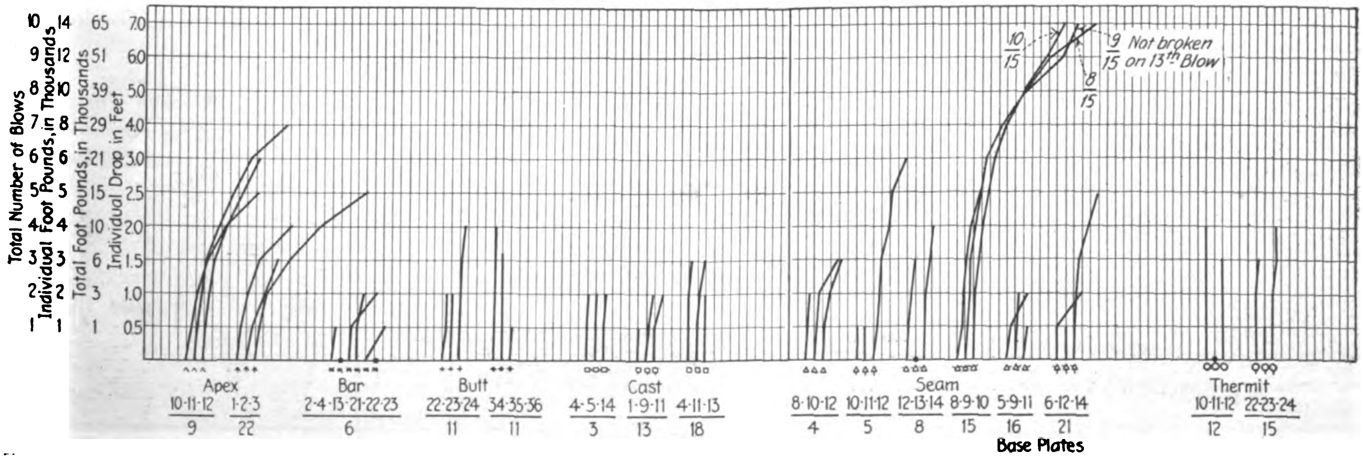


Results of Bending and Conductivity Tests. On the Horizontal Scale (Deflections) Ten Divisions Equal One Inch

Test rails were spiked to the ties and the outside ends welded to the adjacent rails. The joint between the test rails was fastened with standard bolted plates with ½-in. open joint to permit wedging the test rails together at the individual joints as each was cut and welded.

An identification number was assigned to each company making test welds. Each weld bore this identification number and also was numbered individually. Conductivity, tensile and repeated impact tests are being made by the Bureau of Standards. Bending and conductivity tests are being made at Purdue University, and the University of Illinois is making drop tests.

As a result of the tensile tests of three cast-welded rail joints it was found that they first showed separation of the rail ends and finally failed by breaking the cast material. Slag inclusions were found under the rail flange and head. These joints all failed between 200,000 lb. and 300,000 lb.



Deflections of Welded Rail Joints During Drop Tests Made at the University of Illinois, October, 1923-January, 1924

Horizontal scale (deflections) is four divisions equal one inch. Each specimen broke under the blow following the last shown on the chart

Three of the butt-welded rail joints tested were found to be perfectly clean and welded over the entire rail section, the fractures having a crystalline structure. Another specimen developed the yield point of the rail material. Failures occurred at somewhat more than 700,000 lb. in one case and in the other two at a little below and a little above 900,000 lb.

In the case of three seam-welded specimens the failures occurred by the shearing of the weld at contact of fish plates and rail. One specimen had four bolts through fish plates and web; the remaining joints were without bolts. The seam welded joints having Abbott plate reinforcements failed by breaking in the rail section at or near the end of the fish plate. All failures occurred at figures varying from about 300,000 lb. to about 400,000 lb. except one specimen which failed at 800,000 lb.

Failures of Apex type joints in three instances occurred by shearing of bolts and welds, at about 200,000 lb. Lengths of 2 to 4 in. of weld were found to show no fusion with the rail section.

A number of the thermit welds showed blow holes and slag inclusions. Failures occurred at approximately 600,000 lb. Attention is called to the fact that the inserts in the welds tested were not all fused. Slag was found to be trapped under the inserts. The failure began by separation of the rail heads at the unwelded insert.

RESULTS OF BEND TESTS

In making the bend tests two Riehle testing machines, one of 300,000 lb. capacity and the other of 200,000 lb. capacity, were used. The test specimen was placed on two supporting knife edges, so that the joint was midway between the supports, which were spaced to give a span length of 42 in. Load was applied by a knife edge resting midway on the saddle block. The number of load increments was such as to give from 10 to 20 points on the chart for each joint.

In three of the cast welds flaws and air holes appeared in the cast iron at the web and flange. In another a sudden tension failure occurred through the sides of the casting even with the bottom of the flange, while in two cases failure took place through the sides at one end of the casting even with the bottom of the flange.

The butt welded joints all fractured suddenly at the weld. In the Apex joints the seams opened up and failures occurred by bolts shearing. In the tests of the electric seam welded joints, failures occurred both by opening of the seams and by fracture of the rail flange.

KEY TO TEST SPECIMENS

Type of Joint	Made by	Steel from	Joint Numbers
Cast Iron	Cram	Bethlehem	3- 1 to 3-12
Cast Iron	Pinckley	Bethlehem	13- 1 to 13-12
Cast Iron	Wilson	Lorain	18- 1 to 18-12
Bar Weld	George	Lorain	6- 1 to 6-12
Bar Weld	Lorain	Lorain	11- 1 to 11-12
Butt Weld	Lorain	Bethlehem	11-25 to 11-36
Butt Weld	Lorain	Lorain	11-13 to 11-24
Seam Welds			
Carbon Electrode	Clark	Bethlehem	2- 1 to 2-12
Carbon Electrode	Dalzlesh	Bethlehem	4- 1 to 4-12
Carbon Electrode	Estill	Bethlehem	5- 1 to 5-12
Carbon Electrode	Graves	Lorain	8- 1 to 8-12
Carbon Electrode	R. W. & B. Co.	Lorain	14- 1 to 14-12
Carbon Electrode	Ryder	Lorain	15- 1 to 15-12
Carbon Electrode	Steward	Bethlehem	16- 1 to 16-12
Carbon Electrode	Wysor	Bethlehem	21- 1 to 21-12
Metallic Electrode	Gould	Bethlehem	7- 1 to 7-12
Metallic Electrode	Walker	Lorain	17- 1 to 17-12
Metallic Electrode	W. W. & M. Co.	Lorain	19- 1 to 19-12
Apex Type Electrode	Way	Bethlehem	22- 1 to 22-12
Apex Type Electrode	Ind. S. & F. Co.	Bethlehem	9- 1 to 9-12
Thermit Weld	Larned	Bethlehem	10- 1 to 10-12
Thermit Weld	M. & T. Corp.	Lorain	12- 1 to 12-12
Thermit Weld	Ryder	Lorain	15-13 to 15-24
Thermit Weld	Candy	Lorain	24- 1 to 24-12
Thermit Weld	Lincoln	Lorain	25- 1 to 25-12

In the thermit welded joints one specimen failed suddenly through the rail ⅞ in. from the joint; another failed suddenly through the rail ½ in. from the joint and a third ⅞ in. from the joint for the lower half and ½ in. from the joint in the opposite rail for the upper half of the joint. Three other specimens failed through the rail at the edge of the weld and ⅞ in. from the joint; all failures of these three specimens were sudden.

METHOD OF MAKING DROP TESTS

The drop test machine used in making the tests by the University of Illinois conforms to the specifications of the A.R.E.A. The machine is arranged to allow a 2,000 lb. tup or hammer to fall freely from various heights up to 50 ft. The rail supports were bolted to the anvil of the machine and had a cylindrical upper bearing surface with a radius of 5 in. The distance between centers of the supports was 3½ ft.

Rail joints to be tested were placed on the supports with the head of the rail up and with the center of the joint directly under the center of the striking face of the tup. The tup was slowly raised and automatically tripped at a height of 6 in. above the joints. The tup was then raised a short distance above the joint and the test specimens inspected so that the effect of the drop could be noted and recorded. If the joint was bent or developed a crack the extent of the deflection was measured and recorded and the joint removed and photographed. It was then placed back in the machine and subjected to the next blow. After the blow that finally destroyed the joint both ends of the specimen were photographed to show the nature of the fracture. For successive drops the height from which the hammer fell was increased by 6 in. until the height of 3 ft. was reached, after which the increment in height was 1 ft.

The cast weld specimens in general showed no deflections until several blows had been struck. Failures occurred in some instances by fracture of the rail and in other cases the weld failed. The butt welds in most cases showed some deflection after the first blow. Breaking of the weld was the prevailing reason of failure with these joints. In the tests of the bar welds, failures were accompanied by breaking of the side plates.

No outstanding tendency was noted in the experiments with seam welded specimens. In some cases the rail broke without disturbing the weld and in other cases failures occurred along the seams. Among the Apex joints the majority of failures resulted from cracking of the seams. Thermit welded joints failed in most cases by fracture of the rail outside the weld.

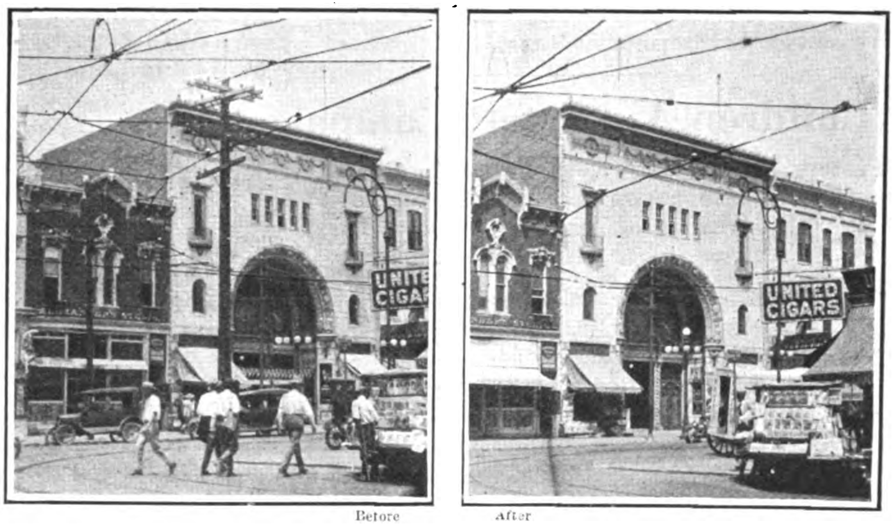
Early in 1923 the Bureau of Standards issued specifications for making conductivity tests on the rail joint specimens submitted. Owing to the fact that few tensile tests were made before the dismantling of the Emery testing machine, definite conclusions cannot be drawn as to the relations between tensile strength and conductivity. The relation between conductivity and bending is shown on an accompanying chart.

Detailed results of the tests so far made, and exact descriptions of the methods followed in making the joints, are given in the report of the committee. This was published in full in the *Journal of the American Welding Society* for February, 1924.

Eliminating Poles in El Paso

European Method of Attaching Span Wires Directly to the Buildings Is Being Employed with Marked Success

THE American electric railway visitor to Europe is nearly always impressed with the way in which the span wires of the trolley line are attached in a great many instances to adjoining buildings instead of to span-wire poles. This not only removes an obstruction from the sidewalk, but it lightens the aërial structure and decreases the total expense of pole maintenance. Such a form of construction, of course, is especially adapted to the narrow streets found in many cities on the continent of Europe, but its advantages are by no means confined to streets of this kind. They apply almost as strongly to broad thoroughfares, and it is interesting to note that the El Paso Electric Railway has been employing this method of overhead construction with success in a number of instances. The accompanying views "Before" and "After" at a typical corner show how it was possible to get rid of an unsightly wooden pole on the corner by attaching the span wires to abutting buildings.


Before After

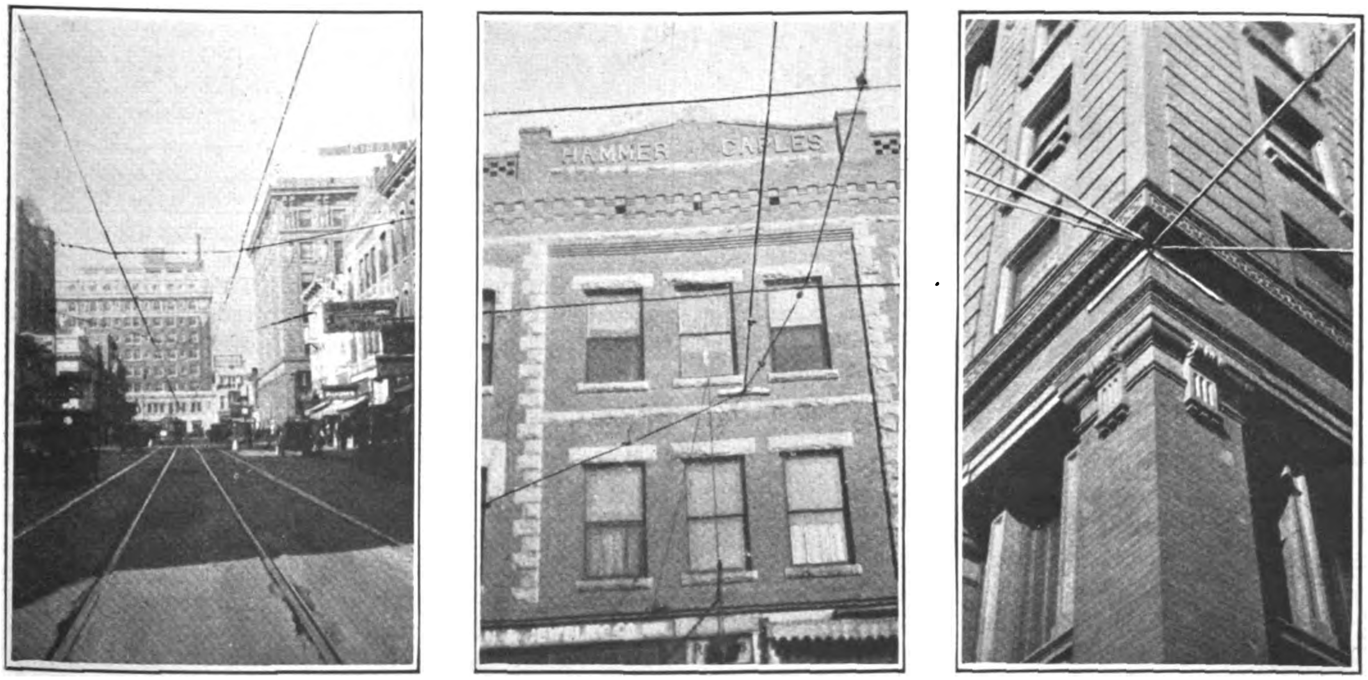
The Same Corner with the Overhead Wires Supported by Wooden Span Pole and Attached to a Building

Owing to the variety of local conditions a standard type of fastener has been found impracticable in El Paso. Those used were made from a ½-in. x 2-in. bar iron, shaped to fit the particular location where it is to be used.

If it is at all possible to place the fastener at a corner where it can be attached to both sides of a building, this method is followed. The iron bar is then simply bent at a right angle and an offset is made to form an "eye" at the vortex of the angle. From this "eye" the supporting spans are attached. Where the pull is straightaway, a flat iron bar of the same size is attached to only one face of the building, and an eyebolt is screwed into a hole near the end of the supporting bar.

All these various types of fastenings are attached to the building, if of stone or brick, by means of ½-in. x 4½-in. expansion bolts, and up to the present time no trouble has been experienced with any of these bolts pulling out.

It so happens that no supports of this kind have been attached to wooden buildings, but no difficulty is anticipated by the company in making the attachment by screws, light bolts, or bolts with washer and nut. Where the attachment is made to both faces of a stone or brick building, two bolts in each face have proved sufficient. Where the attachment is made to a single face of the building, three or four bolts are used. Other than the fastening, there is no change from standard



Some of the Buildings in El Paso to Which the Span Wires Are Attached Are of the Most Substantial Character

The view at left shows San Antonio Street, an important business thoroughfare, after the poles were removed. The second view shows a face pull-off. The third view shows a corner attachment.

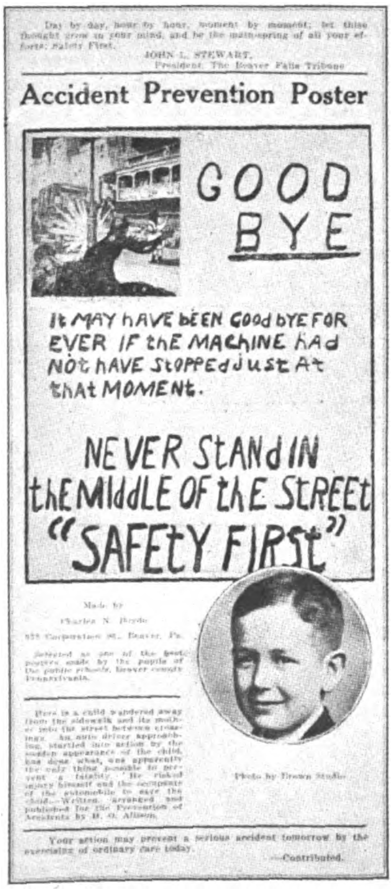
in the overhead construction or in the type of strain insulator used.

At first the company had some difficulty in securing permission to make these attachments, but after explanations were made to the owners of the building as to the benefits in civic beauty, permanence, removal of poles from the sidewalks, etc., the disinclination was overcome. The advantages of this construction from a public standpoint are particularly evident on a handsome business thoroughfare, like San Antonio Street. On this street all the poles that could be spared were removed. As will be seen from the illustrations of individual attachments, the buildings to which the wires are attached are of very substantial construction, including several handsome structures.

Children Aid Safety Campaign

Posters Prepared by 3,000 Pupils in Beaver Valley Schools Emphasize Accident Prevention—The Co-operation of Newspapers and a Local Photographer Obtain Wide Publicity

A NOVEL plan for enlisting a large part of the entire community in safety work is in effect in New Brighton, Pa. This consists of a contest in which some 3,000 school children prepared posters. The best of these are being published serially in the local papers along with photographs of the children preparing them. While not definitely identified with the Beaver Valley Traction Company, the campaign has been planned and conducted by H. O. Allison, safety engineer of the company. As vice-president of the Western Pennsylvania Division of the National Safety Council, he addressed each of the schools of the valley, making as many as seventeen talks in one day. Following the talks a special poster blank, 11 x 14 in., containing on the reverse side suggestions for preparing the posters and a list of 100 suitable topics, was distributed and the pupils requested to make accident prevention posters. No prizes were offered and each poster made was the voluntary act of the student. More than 3,000 posters were received.



Day by day, hour by hour, moment by moment; let this thought grow in your mind, and be the main-spring of all your efforts: Safety First.

JOHN L. STEWART,
President The Beaver Falls Tribune

Accident Prevention Poster

GOOD BYE

It MAY hAVE bEEN GOOd bYE FOR EVER IF thE MAChINE hAd NOt hAVE StOPPEd JUSt At thAt MOMENt.

NEVER StANd IN thE MIddLE OF thE StREEt "SAFEtY FIRSt"

Made by
Charles N. Boyde
[illegible] Corporation St., Beaver, Pa.

Selected as one of the best posters made by the pupils of the public schools, Beaver county Pennsylvania.

Here is a child wandered away from the sidewalk and its mother into the street between crossings. An auto driver approaching, startled into action by the sudden appearance of the child, has done what was apparently the only thing possible to prevent a fatality. He risked injury himself and the occupants of the automobile to save the child.—Written, arranged and published for the Prevention of Accidents by H. O. Allison.

Photo by Brown Studio

Your action may prevent a serious accident tomorrow by the exercising of ordinary care today.

—Contributed.

The posters were displayed at a special safety rally held at the Junction Park pavilion. Some time later judges selected 100 of the best. With the posters on hand the news value and publicity possibility of the posters for the newspapers were quickly seen. A conference with the representatives of the six papers in the territory confirmed this, and each paper agreed to publish a poster daily until the entire hundred had been printed. These are now appearing in the local newspapers.

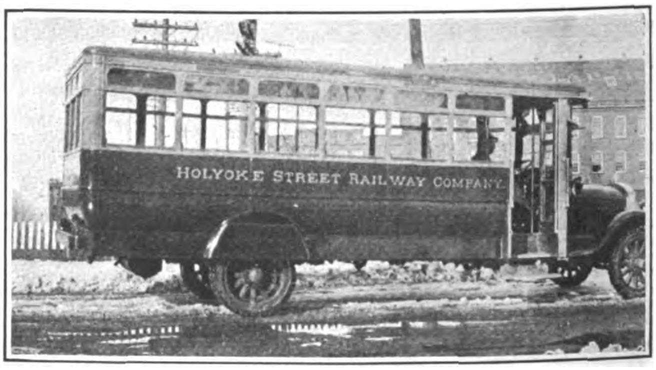
A local photographer was approached and it was suggested to him that to have 100 children call at his studio to be photographed would be of sales value to him. He saw the point and agreed to photograph the children and furnish two prints of each without charge. The picture of each child is reproduced along with the poster. Several people interested in safety and children agreed to take care of the cost of the engravings so that no one was particularly burdened.

With each poster is a brief statement of the safety precautions indicated through a study of the poster. In addition there appear with each poster two safety cautions written and signed by prominent men and women of the district. A typical poster is reproduced. In order that the list of best posters made may be preserved by those who made them, a book containing them has been prepared and is being distributed by Mr. Allison.

Railway Bus Sets Standard

THE Holyoke Street Railway is in the business of supplying transportation to the people of Holyoke, Mass., and it is the belief of the company that it should supply facilities of such high quality that complaints will be forestalled and possible competitors will be discouraged. The railway has been operating buses for about two years and has recently purchased two new Macks.

These buses are painted exactly the same color as the street cars and carry the name "Holyoke Street Railway Company" on the sides. This is done so that the public may thoroughly understand that the street railway is in the transportation business in every way.



Color Scheme and Name Identify Bus with Railway

The buses operate on a 2-mile route with a twenty-minute headway and a twenty-minute round trip time. One bus is in regular operation and the other is kept as a spare. The route runs from the center of the city up a street along which there are no car tracks and through a residential district. The fare is 6 cents, the same as on the cars, and no transfers are issued. By operating buses on this route the company has saved the expense of new track and it has also obviated the necessity of operating a car line which could not be conveniently tied in with any other existing line. Up to the present time the bus line has paid its operating cost but has made no great profit.

Detroit Answers Motorbus Proposal

Rapid Transit Commission and Department of Stree' Railways Present a Brief to the Common Council of the City in Reply to a Proposition to Substitute Buses of a New Type Carrying 250 Passengers for the Surface Cars and Proposed Rapid Transit System

RECENTLY a petition was presented to the Common Council of the City of Detroit for the substitution of a new type of autobus to supplant the present surface cars operated by the city and to forestall the construction of a rapid transit system for which plans are now being prepared by the Rapid Transit Commission. The most revolutionary feature of the plan is the use of a vehicle with a capacity of 250 passengers.

A joint answer has been filed with the Common Council, signed jointly by William B. Mayo, Commissioner and general manager, and Ross Schram, assistant general manager, for the Department of Street Railways, and by Sidney D. Waldon, chairman, and Daniel L. Turner, consulting engineer for the Rapid Transit Commission. This answer, which cites the main arguments against the proposition, is particularly interesting to electric railway men since it expresses the opinion of the city's transportation executives regarding transportation methods where all the facilities are owned by the city, or are being planned as municipal projects. An abstract of the reply, as addressed to the Common Council, follows:

THE CITY'S STATEMENT

The petitioner claims among other things "that the proposed new type of autobus has been proved to be superior to the street car in every conceivable manner." He then recommends that the city "build and prove the bus," and "effect complete substitution of buses for street cars as quickly as possible." The petitioner further claims that "the bus will provide rapid transit on present streets for an indefinite period," and then states that, "assuming the bus will not provide rapid transit in the present streets, it is still worth while as a substitute for street cars, but more particularly it is still the most valuable rapid transit conveyance because it will do everything that a train will do and do it better." The petitioner admits that: "Some may say that this is all premature and should not be thought of until the bus is built and proved."

In this latter conclusion, the commissioners and engineers of both the Department of Street Railways and of the Rapid Transit Commission state that they are in entire agreement with the petitioner. Considering only the major issues involved, they may be stated about as follows:

1. Shall the city decide now that its street railway system is obsolete and proceed to adopt the proposed new type of autobus with which to replace it?
2. Shall the city decide now that the proposed new type of autobus will be able to carry such loads of passengers at such speeds through the streets as to make it unnecessary for Detroit further to consider the use of trains upon exclusive rights of way, below or above ground, as a necessary rapid transit requirement?

These two questions seem to sum up the main points contained in the petition, states the reply.

The street car and the present or future motorbus are held to be essentially surface vehicles, each with its proper place in the scheme of surface transportation of great cities. However, neither the street car nor the motorbus operating upon the street surface will meet the requirements of urban rapid transit, but that safety, capacity, economy in operation, and speed will demand the exclusive right of way, underground in the thickly built-up sections of the city and on the surface, with suitable grade separations wherever possible, in the outlying districts, and with six, eight or ten car train units, as now used in New York City.

At the present time in Detroit the motorbus and the street car are, to a large extent, serving two different purposes and are each aiding the other, even though in some places their routes occupy the same street. The motorbus is a smaller vehicle, giving a seat to every passenger, making fewer stops to take on and discharge a full load, and consequently, giving a faster service between points. For this limited, or special service, the rider pays a special and higher rate of fare.

The street car does not guarantee a seat, but it does stand in the position of giving to Detroit its mass transportation until construction is authorized and completed upon a real rapid transit system. It is, and must continue to be, the backbone of the city's mass transportation until such time as it can be gradually relieved by underground train operation. For the absence of a guaranteed seat the street car gives a ride at a lower rate of fare.

IMPORTANCE OF THE MOTORBUS RECOGNIZED

Following a sketch of the development of the bus as a factor in urban transportation, which has taken place in the last 20 years, the answer states that the importance of the motorbus as an element of urban transportatioin upon the surface is being recognized more and more every day, and it is destined to play an increasingly important part in circulating and distributing the population of our cities in the future. But admitting this fact, the conclusion that the motorbus is now ready to supersede all other means of urban transportation is wholly unjustifiable. The motorbus must still pass through many stages of development before any city can afford to consider seriously substituting the motorbus for the street car for its first step in mass transportation.

While it is not important in comparison with the main issue under consideration, the practical engineering and operating side of the proposed new type of 250-passenger motorbus proposal should be mentioned, states the answer. It is suggested that the city, with an experience covering the use of 48 and 60-passenger vehicles jump to the construction of buses capable of carrying 250 passengers. It is proposed to incorporate into this proposed new type of bus a number of elements not now in regular use in motorbus operation, and with a very limited amount of experience after one is built to launch into manufacturing and operating commitments upon an extensive scale.

To jump from a 60-passenger vehicle, steered and controlled by one man, with fare collection attended to by another man, to a 250-passenger vehicle, also steered and controlled by one man, and with fares collected by another man, with all of the unsolved problems such a jump presents, would not normally be undertaken by any private company with its own money, and with its own future staked upon the result. The evolution would be gradual. Is it wise to recommend doing with public funds what no one has attempted to do, or would seriously consider doing, with private capital?

The city of Detroit has invested in its street railways aproximately $40,000,000. With this system it serves 93 per cent of the total revenue passengers at a 6-cent fare, the remaining 7 per cent being carried by the bus lines and by jitneys at a 10-cent fare. The service offered compares favorably with that offered in any other city.

It is now proposed that this self-supporting transportation system be discarded as rapidly as possible as obsolete and be replaced with a new type of vehicle yet to be built and proved out at city expense. The writers state that they fear that numerous taxpayers might consider such action imprudent.

They are quite in accord with the idea that there should be more buses, as this would avoid the cost of the less important extensions to street railway lines that would otherwise be necessary, pending the construction of a rapid transit system, but they do not advise an increase in buses for the purpose of displacing the surface car system.

STREETS ARE INADEQUATE FOR RAPID TRANSIT SERVICE

Considering the second half of the proposal, that the motorbus be utilized for rapid transit instead of trains on rails, there are inherent and controlling reasons against it. The city's street system is wholly inadequate for any such use, according to the writers. The existing streets were originally planned for a two or three-story town and for man and horse traffic. On the one hand the automobile has been substituted for the horse, and on the other hand people are being piled up layer upon layer in multi-storied buildings. Already the 23-story building has been reached in Detroit, the 32-story building is in prospect, and the end is not in sight. In other words, in some places, we are superimposing ten cities on one, and yet the same circulating and distributing street system that was designed to serve a two-story village is expected to continue to serve a 25 or 30-story city.

The capacity of the land is flexible. The sky is the only limit. But the street capacity is inflexible and made so by the very bulk and cost of the enormous structures that impose the greatest traffic burden upon the streets they hem in so tightly.

What is needed is new street space, not an increased use of the existing streets. Only when rapid transit subway or elevated lines are constructed through the developed and congested sections of the city will this new street space be really provided by building under or over the existing street.

Rapid transit presupposes mass transportation at high speed. High speed is impossible on the surface of the street congested with all other kinds of surface traffic. Again, high speed cannot be attained when the transit vehicles are interfered with by cross traffic at every street intersection. High speed in congested streets is impossible with safety. The essential feature of rapid transit lines is that they must be located where they will not be subjected to interferences from any kind of traffic either along the line or at intersections with it. In the outlying and undeveloped sections of the city the streets can be made wide enough to permit a rapid transit line to operate on the surface over an exclusive right of way in the center of the street, with cross streets carried over or under the line, thereby eliminating all surface interferences. But in the developed sections of the city such a thing is not possible because the streets cannot be widened sufficiently. These are the conditions under which subways or elevated lines must be constructed, thereby permitting a high speed to be attained through the congested districts, at least three to four times what is possible on the surface.

The petition so far as it relates to the substitution of the proposed new type of motorbus for the present street car system is considered to be unwise, uneconomical and contrary to the best interests of the city. As to the claims that the proposed new type of motorbus will provide rapid transit upon the existing streets and make unnecessary real rapid transit on rails upon exclusive rights of way, this is regarded as impracticable and the claims are not borne out by fact. Subway rapid transit will serve the public with the maximum of safety, economy and speed. The motorbus is still in an evolutionary stage, both mechanically and as a surface transportation medium. It has a service to render as an aid to the street car system, but not as substitute for it.

Medical Department in Milwaukee

THE medical department of the Milwaukee Electric Railway & Light Company was begun in a limited way in 1912 and has expanded now so that it includes the complete medical, surgical and obstetrical care of employees and their families. It is under the direction and part of the work of the Employees' Mutual Benefit Association.

In an article on the department by Dr. E. W. Miller, medical director, in the January issue of *Nation's Health*, stress is laid upon the need for the physicians in such a department to continue some private practice as it gives them a wider experience and broader vision than would be likely with full time medical men. In Milwaukee the medical service is available not only to the employees but their families, and this, in the opinion of Dr. Miller, is an important influence in improving the capacity of the employee for business. If he knows the best of medical and surgical care for the members of his family is at his immediate disposal, without worry as to the expense incurred, he can carry on his work in a proper and normal frame of mind. The department also includes two visiting nurses.

Besides direct medical care of employees the department has done much in preventive medicine on the Milwaukee system, including the drafting of specifications for employment in the different branches together with medical examination of all applicants. The article points out that this does not mean that a person with some minor physical defect cannot obtain employment, but the various positions are classified medically to determine what defects are serious for each. At times this plan really favors an applicant who on strict physical examination might otherwise be rejected.

Measuring Electrolytic Currents in Soil

Two New Methods of Measurement Are Proposed, One Based on Substitution of Known Resistance and the Other on Balancing the Current to Give Zero Galvanometer Reading—Latter Method Eliminates Calculation of Earth Resistance—Method Useful in Quantitative Electrolysis Tests

By B. A. Williamson
Electrolysis Engineer Los Angeles Gas & Electric Corporation

THE measurement in direction and quantity of the electricity flowing between the soil and a pipe for unit area of surface or length of pipe at any desired location is the basic index by which the intensity of electrolysis may be estimated and the efficiency of the mitigative measure determined. Unfortunately the problem of finding an accurate method of detecting and measuring current in the soil adjacent to a metallic conductor has been attended with great difficulties. In the writer's opinion these have been only partially met. A number of methods have been described, but it would seem that they have certain limitations either in basic principle, accuracy or scope in the matter of practical application. It is believed that this research work has marked a slow but steady progress that will lead ultimately to a standard of electrolysis engineering practice comparable with other present-day measurements.

It is desired to present herein two methods, believed to possess value and certain new features, to describe how the required physical apparatus may be constructed and assembled at low cost and to discuss frankly their utility and limitations.

The problem of determining current flow in the earth does not permit of an ordinary solution based on Ohm's law, as the area of the cross-section of the path of the current increases in direct proportion to the distance from the center of the pipe. The current density and the effective soil resistance decrease as the first power of this distance and the potential or IR drop decreases as the second power. In the equation $E = IR$ it would be possible to determine the potential E between two points, m and n, within the soil, but no direct way exists for measuring either I or R for substitution in the equation for the solution of the other. In fact, there exists no straight line relationship.

If the pipe P in Fig. 1 is discharging current through the earth to the rail R by reason of a potential difference between them that is proportional to the vertical distance of P'-R', the earth adjacent to the pipe will have a potential gradient of a form represented by the curved line p-r. A potential P'-p' will be spent at the surface of the anode P and a potential r'-R' will be expended at the surface of the cathode R in a chemical action known as electrolysis. This will leave an unexpended potential of p'-r' that is effective in causing the vagrant current to flow against the resistance of the earth. It is evident that if the current leakage from the pipe is to be calculated from data involving the potential drop within the soil and its resistance, three factors must be considered, namely: (1) The variation of the current density in the soil; (2) the potential drop within the soil; (3) the resistance of the soil.

Having indicated that Ohm's law is not practically applicable to a solution of the problem, a method will now be offered which is based on this law, but which in practice requires neither the measurement of the fall of potential in the soil nor of its specific resistance. Before proceeding with the development of the solution, it will be necessary to describe briefly a non-polarizable electrode which is an element in the physical equipment. This electrode was designed by Professor Haber to provide a means of determining the potential gradient of the earth by furnishing non-metallic contact between the earth and the voltmeter terminals, thereby avoiding the galvanic potential occasioned by ordinary metallic electrodes.

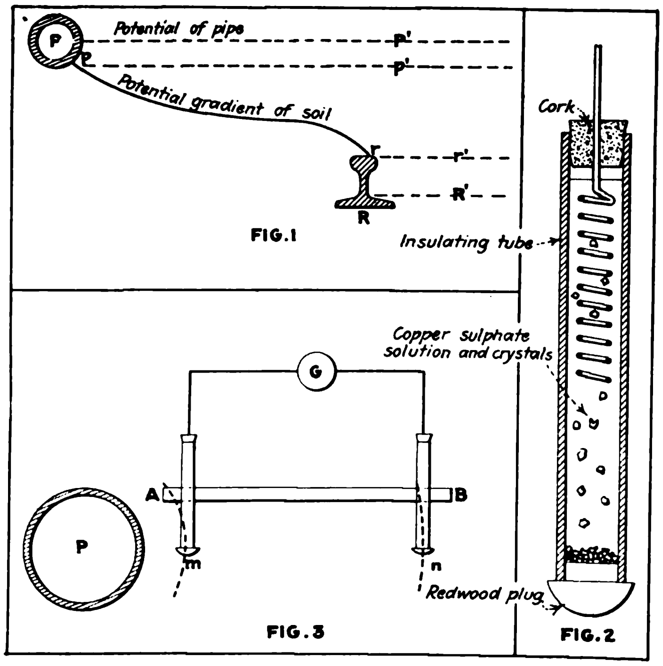


Fig. 1—Drop of potential at surfaces of the electrodes and within electrolyte earth.
$P'p'$ = potential spent at anode.
$p'r'$ = potential effective for overcoming the resistance of the soil.
$r'R'$ = potential spent at cathode.
Fig. 2—Details of a non-polarizable electrode.
Fig. 3—How two non-polarizable electrodes may be definitely spaced in the earth adjacent to a pipe and used with the galvanometer G to measure electrolytic current.

One form of construction, shown in Fig. 2, consists of a tube of rubber or other insulating material, filled with a saturated solution of copper sulphate, stoppered at the end in contact with the soil with a thin porous wooden plug and closed at the other end by an ordinary cork through which is passed a copper voltmeter wire that makes intimate contact with the solution by being wound in a spiral.

If the pipe P, Fig. 3, is discharging current to the soil, the potential will be higher at the point m than at the point n. Let two non-polarizable electrodes that are definitely spaced with respect to each other and the pipe P by the insulating bar A-B be placed at these points. Assuming uniform soil resistance and equal distribution of current in all radial directions, the potential difference between the points m and n, located on imaginary circles concentric with the pipe, will be the same for all radial positions.

If I represents the current leakage in amperes per unit length of pipe, and R is the resistance of the soil between concentric circles per unit length of pipe, then E, the potential drop in the soil between m and n, is equal to IR.

Since it is impossible to measure the resistance R, it is necessary to resort to the expedient of measuring the resistance between the electrodes located at m and n. This resistance, R_s, is proportional to the resistance R, and

$$E = CIR_s \qquad (1)$$

where C is a geometric constant depending on the size of the electrodes, their spacing and the diameter of the pipe.

This potential difference E between the electrodes at the points m and n will cause a current, I_g, to flow through the shunted circuit formed by the galvanometer of resistance R_g and by the electrodes, whose combined resistance is R_e. That is,

$$E = I_g\ (R_g + R_e) \qquad (2)$$

This current I_g in the shunted circuit will produce a deflection of the galvanometer of θ divisions. If c is a constant expressing the ratio between the current I_g through the galvanometer and its deflection θ, the last equation may be rewritten thus:

$$E = c\ \theta\ (R_g + R_e) \qquad (3)$$

The quantity E may be eliminated by evaluating equations 1 and 3. Equating them and solving for I,

$$I = K\ \theta\ \frac{R_g + R_c}{R_s} \qquad (4)$$

where the constant K replaces the ratio of constant c/C.

MEASURING THE SOIL RESISTANCE

The resistance of the soil between the electrodes may be determined by means of a battery and voltmeter by a slight modification of the well-known direct-deflection method of measuring a high resistance. Two readings are taken, one with the voltmeter directly across the battery and the other with the earth resistance in series with the voltmeter. The Standard Handbook* gives the value of the high resistance as "$R = R_v\ (d - d_1)/d_1$, where $R_v =$ the resistance of the voltmeter (the greater the resistance per volt, the higher the precision), $d =$ deflection of the voltmeter in first reading, $d_1 =$ deflection in second reading." In this particular case it is evident that the resistance of the electrodes R_e may be considered a part of the voltmeter resistance, thus:

$$R_s = (R_v + R_e)\ (d - d_1)/d_1 \qquad (5)$$

This value of the soil resistance, R_s, should be substituted in the working equation 4, and with the deflection θ of the galvanometer determined the value of the leakage current I per unit length of pipe.

This method is subject to a certain degree of error due to the factor of the contact resistance being neglected in the development of both the equations 4 and 5. If it were possible to make a separate measurement of the contact resistance R_c, equations 4 and 5 would be written thus:

$$I = K\ \theta\ \frac{R_g + R_e + R_c}{R_s} \qquad (4a)$$

$$R_s = (R_v + R_e + R_c)\ (d - d_1)/d_1 \qquad (5a)$$

It will be noted that when the value of R_s as determined by equation 5a is substituted in equation 4a, the indeterminate quantity R_c tends to elimination by appearing in both the numerator and the denominator. In order that this error may be kept to the lowest possible limit the contact plugs of the electrodes should be plastered lightly with thin mud in taking the galvanometer reading θ and the two voltmeter deflections d and d_1.

CALIBRATION OF THE SET

The set is calibrated by a single and separate measurement in the laboratory of the resistance of the voltmeter R_v and of the non-polarizable electrode R_e. The value of the constant K may then be determined experimentally by impressing a definite leakage current of I amperes on an isolated pipe line to permit the substitution of numerical values in all quantities in equation 4, except K, for which solution is made.

On account of the uncertainty due to the contact resistance, it is believed a more accurate measurement may be taken by a method now to be proposed, or by an ingenious method and instrument that were developed by Burton McCollum, electrical engineer United States Bureau of Standards, in the ELECTRIC RAILWAY JOURNAL, Nov. 5, 1921. Credit belongs to him for having successfully perfected a method of measuring soil currents through the application of the basic principle of using non-polarizable electrodes.

THE ZERO DEFLECTION METHOD

This method is somewhat similar to the preceding in that it is based upon the general principle of determining the current discharge from a pipe by the fall of potential in the soil. Use is made of two non-polarizable electrodes, and the value of a geometric constant is obtained by a process of calibration. Its accuracy lies in its simplicity and in the avoidance of the necessity of measuring the soil resistance in any way.

The pipe P, Fig. 4, is represented as discharging current to the soil along the dotted lines extending in radial directions. A certain small portion of the vagrant current will tend to take the shunted circuit formed by the non-polarizable electrodes m and n and the galvanometer G. By means of two metallic electrodes, M and N, a battery, B, ammeter A and a variable resistance, C, a measured current is passed through the soil in a general direction opposite to that taken by the vagrant current, and whose intensity is just sufficient to neutralize that of the vagrant current along the radial direction m-n. When this condition has been realized, it will be indicated by a zero deflection of the galvanometer.

If I denotes the value of the vagrant current being discharged or received per unit area of surface or length of pipe, and i represents the current in ammeter A for neutralization for a definite diameter of pipe and spacing of electrodes, it is evident that there will be a definite geometric factor of proportion between these currents for all homogeneous soils regardless of their specific resistances.

$$I = K\ i. \qquad (6)$$

After the value of K has been determined experimentally, a field measurement for electrolysis is taken by manipulating the applied battery voltage and the resistance to obtain a zero deflection of the galvanometer by a current, i, which is read and substituted in equation 6.

While this method is simpler and more accurate than the preceding, the test set requires instruments that are less likely to be found in the ordinary laboratory. The ammeter must be of high sensitivity, of the degree of about 1 milli-amp. for full scale deflection. The resistance should have considerable range and flexibility to meet the extreme variation in the soil resistance and the intensity of the vagrant current.

---

*Standard Handbook for Electrical Engineers, Fifth Edition, page 148.

A portable, direct-reading type of D'Arsonval galvanometer should be selected, having a current sensitivity such that an impressed potential of 1 volt through an external resistance of about 1.25 megohms will give a deflection of one division. Its sensitivity may be reduced, where desirable, by adding an external resistance.

UTILITY

The value of a method for testing for electrolysis should be appraised on the basis of comparative merit rather than by the standard of absolute worth. It is perhaps sufficient to state that while there are a number of ways for testing which may be described as indicative or qualitative, such as voltage readings between the rails and pipes, there is practically no recognized method of making a quantitative measurement of the current leakage unless it is the one by Mr. McCollum to which reference has been made. Though the assumption of the ideal conditions of homogeneous soil and an equal distribution of current in the soil in all radial directions from the pipe for the purpose of the development of the theory of the solution lead to somewhat erroneous conclusions in practice on account of these conditions not being realized, yet the best solution of today must be accepted, subject to its known limitations, with an idea to present needs and future development.

LIMITATIONS OF THE METHODS

The limitations of these methods of testing electrolysis by the use of non-polarizable electrodes may be included and discussed under four general classifications as follows:

Time.—These tests are confined to that class known as instantaneous, since galvanometers are not usually built in the recording chart type. Electrolytic conditions are of such a variable quality that no accurate estimate of them can be made unless the tests show the average conditions for a twenty-four-hour period.

Location.—This system of testing contemplates the installation of the test set adjacent to the pipe. Since nearly all the mains and the greater part of the services are laid under sidewalks and public streets, which are usually paved or surfaced in some way, it is evident that considerable effort and money must be spent in making these tests. It might seem possible to drill test holes to the pipes to avoid the expense of excavating, but experience has shown that the average main or service pipe is too indefinitely located to permit this being done with precision. Aside from the uncertainty of the location of the pipe, rocks might be mistaken for the pipe or interfere with the drilling of the hole. In an attempt to overcome these difficulties the writer located the services beneath the parking between the curb and sidewalk by "listening in" to a high-frequency inductive current that was impressed on the pipe system by means of a head-set and an exploring coil made of fine wire wound on the wooden rim of a bicycle wheel. Tests were made for a time upon the service pipes at this location, which seemed the best from the standpoint of expense, but were discontinued after a time, for there was no reason for believing that the electrolysis was the same on the shallow service pipe in the drier soil as on the deeper mains nearer the car tracks where they were inaccessible except at the time of making repairs or running services.

Range.—Unlike rust, the corrosive action of electrolysis is not uniformly distributed over the surface of the pipe but is concentrated in pits and may be confined to a considerable extent to general areas, as on one end or side of a pipe. Since the test set is placed but a few inches from the pipe under investigation, it is evident that the range of the test is somewhat limited. Just as electrolytic conditions may vary minute by minute during the day, they will vary in a similar manner foot by foot along the length of the pipe. The same necessity exists for taking a number of readings at different locations to obtain a fair estimate of the district as a whole as exists for taking a number of instantaneous readings at various times in order to obtain a good idea of the average electrolytic condition during the entire day.

Distortion.—The term distortion is used to indicate a distribution of current at variance with the ideal condition assumed, that a current of dynamic origin flows to or from a pipe in a continuous and homogeneous soil in radial directions at uniform intensity. The soil must be removed for the installation of the set, which violates the assumption of continuity of the soil. The earth, to which the non-polarizable electrodes are applied in making the test, will either have a lesser or greater moisture content, depending upon the weather, than the surrounding earth, which affects the homogeneity of the soil. A vagrant current may exist in the soil by reason of sub-surface conductors, other than that under inspection. A soil current of galvanic origin, due to chemical inequalities at the surface of the pipe or of the pipe and other metallic bodies, may act in a way to increase, decrease or neutralize the reading of the instrument that is due to vagrant current. For instance, if comparative tests are made upon a galvanized iron service water pipe in metallic circuit with a black iron gas service pipe, the former may show a current leakage to the soil and the latter may show a leakage from the soil.

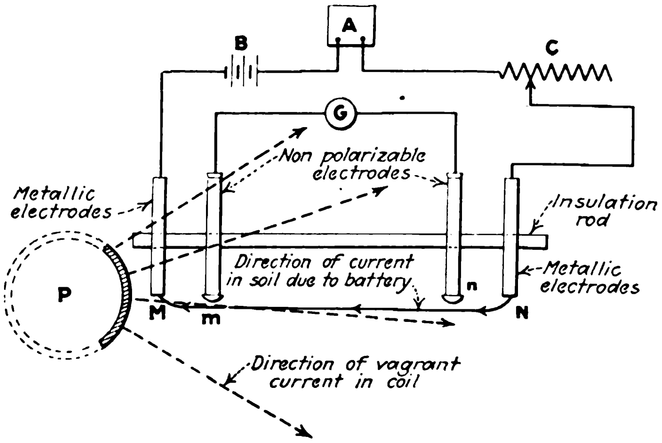

A
B
C
G
Non polarizable electrodes
Metallic electrodes
Insulation rod
Direction of current in soil due to battery
n
Metallic electrodes
P
M
m
N
Direction of vagrant current in coil

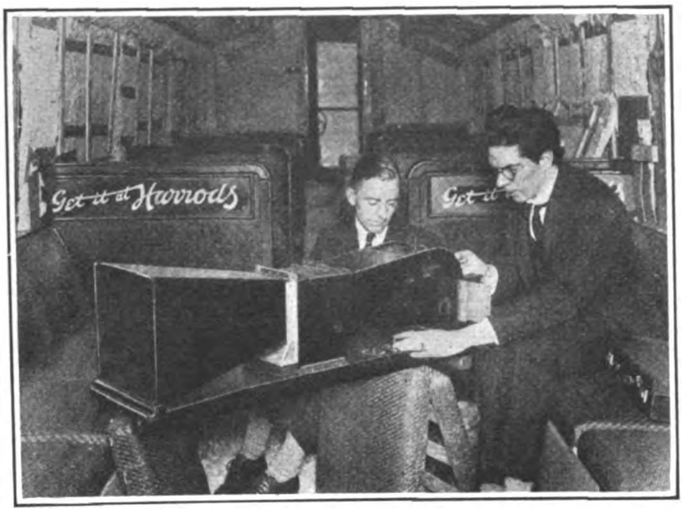
Fig. 4—How a Small Battery Current May Be Passed Through the Soil to Neutralize the Vagrant Current and Give a Zero Deflection

VALUE OF THE METHOD

It is believed by the writer that this method has great value and will grow in favor as a means of making fairly accurate quantitative tests for electrolysis. In view of the necessity of uncovering the pipe it will probably be confined in practice in general to cases where the pipes are exposed for repairs, extensions, or running services and to particular cases where the expense of making excavations for the tests would be of little consequence.

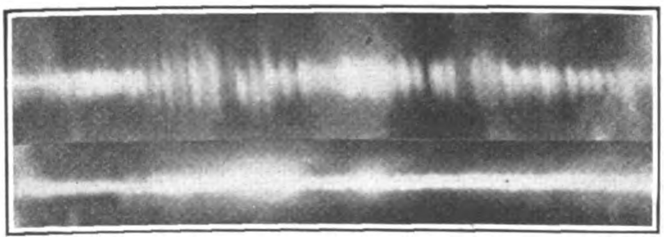
Noise in London Cars Photographed

IN AN article in ELECTRIC RAILWAY JOURNAL for Jan. 26, 1924, page 135, on the reduction of noise in train operation, reference was made to a series of tests under the direction of Prof. A. H. Low with a device known as the audiometer. The accompanying illustration shows the audiometer as used in the work by Professor Low and an assistant. The sound caught in the horn causes a diaphragm to vibrate, which in turn operates a mirror, causing a beam of light to play on a sensitized film. Temporary padding used in the experiment as one means of noise prevention is shown on the walls and roof of the car.



Measuring Noise with an Audiometer in Experimental London Tube Car

The two sound photographs reproduced show the influence of padding and other changes described in the previous article on the amount of noise within the car. The upper photograph shows the results with only the floor and lower sides of the carriage padded and before special treatment had been applied. The wide spread of the vibrations is an indication of the quantity of noise. The lower sound photograph shows the result with the padding on all parts of the interior and with the wheel shrouded. The elimination of vibration is indicated by the concentration of the beam of light in a single line. With the padding arranged as in this test the ticking of a watch could be heard 1 ft. away from the ear.



Sound Photographs Obtained by Audiometer

Above—With only floor and lower side of carriage padded, before treatment. Below—With padding and wheels shrouded, ventilators half open.

The London Underground Railways is now obtaining delivery on 191 cars of the new type, in which the recommendations of Professor Low for noise elimination have been embodied. Tests made on the new cars show a considerable reduction in the noise.

The Readers' Forum

Should Have Rail Corrugation Investigation

ROBERT W. HUNT COMPANY, ENGINEERS
CHICAGO, Feb. 25, 1924.

To the Editors:

The article on "Rail Corrugation Experience" published in the JOURNAL of Feb. 16 is timely and very interesting. Apparently many companies suffer large expense annually because of this aggravating trouble, for which no specific cause or cure has yet been discovered. The opinion in some quarters that corrugation is in some way a feature of electrically operated roads is decidedly incorrect. One of the worst cases of corrugation the writer ever saw is on a steam-operated road of standard character in every way. Other instances of lesser degree can be easily found on almost any steam road. The facts go to show that the real cause of corrugation is probably in the rail when it leaves the mill. The cure is quite another matter, but if the cause could be definitely ascertained some effort could no doubt be made to effect a remedy.

Mere discussion of the subject will produce only a maze of confusing or contradictory statements. An extensive investigation is being made of various types of welded rail joints, and in the interests of economy it would certainly seem that funds should be made available for instituting an investigation into the cause of rail corrugation.

C. W. GENNET, JR.,
Manager Rail Department.

Detroit Train Increases Street Capacity

DEPARTMENT OF STREET RAILWAYS
DETROIT, MICH., March 21, 1924.

To the Editors:

In the discussion of the three-car articulated train for service on the Woodward Avenue lines at Detroit, one very important feature has been overlooked; that is, that by the use of this unit a greater volume of traffic may be handled than is possible with the present motor car and trailer equipment.

At present it is considered that we are operating as many cars on the street as is possible, and our problem is to move more people without further congestion. During rush hour the cars are spaced approximately 440 ft. apart, so on the assumption that this is the minimum spacing, it means a seating capacity of 0.198 per lineal foot of track with a motor car and trailer, while with the three-car articulated train the seating capacity per lineal foot of track is 0.249 or an increased carrying capacity of more than 25 per cent.

H. S. WILLIAMS,
Assistant Superintendent of Equipment.

Route Signs Differentiate Turnbacks

IN PARIS all tramway routes are numbered or lettered, and the cars carry the number or letter of the route conspicuously displayed. Where a car is scheduled to be turned back at a point short of the terminal, the car route sign or letter carries a broad red horizontal stripe. These numbers and letters are also used to distinguish the routes on maps issued by the company and sold for 25 centimes (or about 1½ cents) each.

Association News & Discussions

American Railway Engineering Association Holds Largest Convention

Proceedings Contain Many Points of Interest to Electric Railway Engineers, the Gist of Which Is Given Here—National Railway Appliance Association and Signaling Section, A.R.A., Also Hold Meetings

THE largest annual convention in the history of the American Railway Engineering Association was its 25th meeting, held in Chicago, March 11 to 13. Final registration figures show a total of 987, which exceeds the previous maximum of 859 registered in 1922 by 15 per cent. Sessions were held morning and afternoon of each day, the time being devoted largely to the discussion of committee reports. The annual dinner was held on Wednesday evening. It was necessary to turn a number of applicants away, the last seat being sold hours before the time for holding the dinner.

The National Railway Appliance Association held an exhibit conjointly with the meetings, and the Signal Section of the American Railway Association held its annual meeting on Friday immediately following the session of the Engineering Association.

PRESIDENT LEE STRESSED IMPORTANCE OF THE ENGINEER

In his presidential address Edward H. Lee, vice-president Chicago & Western Indiana Railroad, stressed the place of the engineer in the development of American railroads. "It is hardly too much to say that, physically speaking, they created the railroads," he stated. "They invented the locomotive, and the tracks and roadbed upon which it runs. They likewise developed a multitude of structures, and the many types of equipment that, taken together, make up the railroads as a unit. They aided in the effective organization of the railroads for operating purposes, and had an influence upon establishment of the rate structure of the country's railroads."

Although twenty-five years ago relatively few engineers occupied high official positions, since then men of this training have been advanced to higher places in increasing numbers, according to Mr. Lee. In this period conditions have changed greatly, and new and grave problems are confronting the railroads. Excessive regulation, adverse labor conditions, and the decline of the morale of the working force, coupled with the great advance in the cost of materials and supplies, have largely increased the cost of transportation and been a source of great discouragement to railroad managements. He feels that the question of morale is possibly the one in which the engineers as individuals can affect the situation most actively. Proper education of the right kind will show the worker that his own best interests are tied up with the best interests of his company, and that a fair day's pay merits a fair day's work.

"Under the transportation act," Mr. Lee said, "the railroads are enjoying greater prosperity than for years past. But every single member of the association should be a publicity agent who leaves no stone unturned, when in contact with anyone outside the railroad game, to affect his opinion favorably toward the railroads."

At the Wednesday afternoon session G. J. Ray, chief engineer Delaware, Lackawanna & Western Railroad, was elected president of the association for the ensuing year.

At the exhibition of the National Railway Appliance Association, which occupied the Coliseum and annex during the sessions, 166 exhibitors had displays. At the annual meeting of this association, A. J. Filkins, president Paul Dickinson, Inc., was elected president.

Some of the more important points in the committee reports, which may be helpful to electric railway men, follow:

WOODEN BRIDGES AND TRESTLES

The committee on wooden bridges and trestles recommended a number of changes in the manual, including specifications for workmanship for pile and frame trestles of untreated material to be built under contract. Work in progress was reported on the useful strength of new, old and treated timber when used in railway trestles, which is being worked out in conjunction with the Forest Products Laboratory. The committee agreed unanimously that the ballast deck has many advantages over the open-deck timber trestle. The work indicates that the ballast-deck structure should be constructed with treated material. The report was adopted.

BALLAST

A few changes in the manual were recommended by the committee on ballast, the principal one being the addition of the yardage of stone and gravel ballast to the ballast sections adopted as recommended practice. It also was stated that there seems to be considerable sentiment in favor of a smaller size of stone if the material is hard trap rock or granite. It was felt unwise to adopt general rules for the handling of mechanical tampers, but it was recommended where track is being lifted from 1 to 3 in., out of face and on stone, that for use as an individual section tool a two-tool pneumatic or a two-tool electric tamper be used. As an alternate two-section tool a four-tool pneumatic or electric tool may be used.

TIES

The committee on ties has brought up to date its tabulation on substitute cross ties, showing the various test installations in progress. A tabulation was included showing the use of ties of various grades, lengths and spacings in main line, branch line and yard tracks. Changes in the standard reported by various roads are principally for thicker, wider or longer ties for use under the heaviest main line traffic. In general these call for 7-in. x 9-in. x 8-ft. 6-in. ties, spaced 20 per 33-ft. rail. Tables also were presented showing the amount of tamping, the bearing area on the ballast, and various grades of ties in use. The least practicable space between ties to permit tamping was stated to be 10 in. After considerable discussion, particularly with regard to the permissible spacing of ties, the report was adopted.

UNIFORM GENERAL CONTRACT FORMS

A number of forms of agreement covering such relations as trackage rights, joint use of passenger and freight facilities and the placing of snow or sand fences beyond the company's property line were presented by the committee on uniform general contract forms. On the matter of arbitration, the forms of limited arbitration reported on to the association were (a) classification of material not clearly covered by contract; (b) delays arising not the fault of the contractor; (c) changes ordered not clearly covered within the terms of the contract. It was brought out in the discussion that sooner or later the National Conference for Uniform Construction Contract Forms and the other national organizations concerned will bring out some form of national construction contract. The report was adopted for inclusion in the manual.

BUILDINGS

For freight houses a plank floor laid on wooden joists is recommended by the committee on buildings as satisfactory and economical, except in larger and more important freight houses, where a floor of concrete is usually justified. Concrete floors are approved for freight storage houses, which are usually of fireproof construction. For blacksmith shops it is stated that floors of cinders, earth or clay are to be preferred in all cases. For machine shops, wood plank floors are favored, as they are for freight car repair shops. Concrete floors meet all requirements for paint shops, and it is stated that it is doubtful if a more expensive type of floor is justified. Where paint is sprayed on, a floor of cinders is suitable. Wood-plank floors are considered desirable for carpenter shops, where considerable bench work is done, because of the comfort to workmen they afford. Because of the necessity for fireproof construction, concrete is recommended for oil houses.

On the subject of paint, the committee believes that satisfactory and economical results could be obtained by placing before the reputable manufacturers the requirements that the various classes of paints are to meet, and depending on their judgment and ability to produce the most efficient paint for the service expected.

Considerable discussion ensued, particularly regarding the subject of floors. It appeared that considerable success had been obtained with creosoted wood floors having a comparatively thin wooden wearing surface. The report was accepted with minor exceptions.

Standardization

The committee on standardization stated that its work during the past year had consisted principally in co-operating with the American Engineering Standards Committee and the Bureau of Simplified Practice of the United States Department of Commerce. Progress has been made in additional standard plans for double slip switches, solid manganese crossings and for spring rail frogs and slip split switch fixtures for heavy rails of 6½-in. height and over; general specifications for steel railway bridges and specifications for movable railway bridges; specifications for the construction of overhead electric supply lines for railroad use on railroad property; specifications for porcelain insulators for railroad supply lines; rules for the protection of all sidings from danger due to stray currents, and specifications for insulated wires and cables.

In the ensuing discussion the organization of the American Engineering Standards Committee, with respect to the approval of the project by the original sponsor association, was taken up by E. A. Frink, chairman of the committee, and the meeting adopted a resolution proposed by him, that the American Railway Engineering Association believes that it will be a serious mistake on the part of the A. E. S. C. to change its constitution and rules of procedure so as to eliminate, or even impair, the veto power now possessed by the sponsor of a project.

Economics of Railway Location

The committee on economics of railway location presented a progress report covering principally the relative merits of increasing tonnage by reducing ruling grades or by the use of more powerful locomotives, including consideration of momentum grades and the availability of the locomotive booster. Other subjects under consideration by the committee included the economics of railway location as affected by the introduction of electric locomotives. It was stated that the sub-committee did not feel justified in submitting a report on this subject at the present time. The report was accepted as information.

Stresses in Railroad Track

A progress report was presented by the special committee on stresses in railroad track. During the year an extensive series of tests was conducted on both straight and curved track on the electrified section of the Chicago, Milwaukee & St. Paul Railway in Montana, and another series on four Eastern railroads. The St. Paul tests were made at various speeds up to 60 m.p.h. on straight track, 50 m.p.h. on a 6-deg. curve, and 40 m.p.h. on a 10-deg. curve. Several types of electric locomotives and also a Mikado freight steam locomotive were used.

An interesting set of tests intended to determine the effect of the regenerative features of the electric locomotive upon flange wear was made by coupling two electric locomotives together and running them around a 10-deg. curve, first the head one motoring and the other regenerating and then the second pushing and the other regenerating. The results so far worked up appear to show that the position of the flange of the drivers with respect to the edge of the rail was not the same for the two conditions of motoring and regenerating.

The committee stated that sufficient progress had been made to indicate that interesting comparisons may be expected of the stresses in rails produced by the various wheels of the several forms of electric locomotives and those produced by the steam locomotive, both on straight track and curved track. The purpose of the tests made in the East was to try to determine the effect of canting the rail in producing changes in the stress in the rails, both on straight track and on curved track, as having a bearing on the wear of the rail and the maintenance of the track, as well as upon the strength of the rail. Not enough progress had been made in working up the data to indicate whether conclusive evidence had been obtained, but the many auxiliary observations on the tilting and lateral movement on the rails themselves promise to give information of real value.

Iron and Steel Structures

A large amount of material was presented by the committee on iron and steel structures, including classification of bridges, specifications for steel highway bridges, electric welding of connections in steel structures, tests of I-beams connected in groups by diaphragms and bracing, and column tests. Elimination of the options between punched work and reamed work now allowable in the specifications for steel railway bridges was recommended, as the committee stated that it proposed to make tests to determine the relative values of the two kinds of work and, if practicable, their relative cost. Classification of railway bridges with respect to their ratings and of the equipment they are designed to carry was proposed. The general specifications for steel highway bridges covering fixed spans less than 300 ft. in length have been revised to suit the conditions of heavy motor-truck traffic.

The report on electric welding of connections in steel structures contained a short description of the resistance and arc methods of welding, and a bibliography covering the latest articles on the subject. It is stated that it is quite evident that sufficient progress in the welding of steel structures has not yet been made to justify the association in taking any action, so that the committee thought it advisable to keep in touch with current experiments. The specifications for steel highway bridges were received as information by the association. The report on tests of I-beams, column tests, and electric welding were accepted as progress reports.

Roadway

On the economics of filling bridge openings, the committee on roadway made a continuation of an analysis comparing renewals under existing conditions and replacements by elimination of the bridge.

Further study was made by this committee on deferred construction costs chargeable to track laying and surfacing. A detailed study of 29 lines seems to prove that there are greater costs incurred in track maintenance labor during the period of operation immediately following construction than during the period after the roadbed has become seasoned. The costs determined by the investigations are stated to be specifically seasoning costs. The committee states that its studies indicate that the seasoning period averages a little over five years. It was also stated that if the standards of a low class branch line were raised to a higher standard, a secondary seasoning period would ensue.

Regarding the revision of roadway sections to meet requirements of standard ballast sections, the committee recommended a change in the manual to state that Class A railways, with constant and heavy traffic, should have a minimum permanent width of 20 ft. of subgrade. A roadbed shoulder of not less than 18 in. should be maintained outside the toe of the ballast slope.

The revision of the roadway section was adopted with the provision that it should apply to single track. The other reports of the committee were accepted as information.

Electricity

The committee on electricity, E. B. Katté, chairman, presented a 58-page report. Revised tables were submitted showing clearances for third rail and overhead working conductor, compiled from the returns from all the electrified steam railroads in the United States. The work of electrical interference has been delegated to a national joint committee on inductive co-ordination with the view of establishing common practice and general rules with regard to the mitigation of inductive interference.

The work of the sub-committee on electrolysis has been referred to a somewhat similar American committee on electrolysis, and it was recommended that representation on this committee be continued.

The committee on electricity has been

co-operating with the Bureau of Standards in the revision of the National Electrical Safety Code, under the procedure of the American Engineering Standards Committee. This work is progressing in various sub-committees.

A tentative specification for the construction of overhead electric supply lines for railroad use on railroad property was submitted. This report covered such questions as types of construction; clearances; grading; mechanical loading of lines; material sizes and sags of wires and cables; insulators; conductor attachments; insulator pins; cross arms; strength of supporting structures; wood poles; steel structures; concrete; guys; grounding, and permissible unit stresses and proportion of ultimate strength for various supporting structures.

Standard specifications for insulators were presented as tentative recommended practice. It was recommended that the study be continued and that the committee collaborate with the appropriate committees with a view of next year submitting a specification acceptable to all the sections of the American Railway Association. The specifications submitted call for porcelain made by the wet process, and provide for inspection and assembly, and tests as required by the standards of the A. I. E. E. In an appendix some causes of insulator failures were given, and the methods of selection of insulators according to atmospheric and climatic conditions. The recommended revisions of the manual were adopted.

TRACK

A number of changes and additions to the nomenclature and definitions in the manual were proposed by the committee on track. These include general track terms, slip switch terms, frog terms, guide rail terms, crossing terms, and turnout terms.

Plans for No. 10 double slip switches with movable center points were offered for adoption as recommended practice. These plans were prepared on the basis of No. 8 double-slip switches adopted last year as recommended practice, and in line with adopted switch and frog plans.

Plans of solid manganese crossings of steam railroad over electric railway, and steam over steam railroad were also offered for adoption as recommended practice. These plans were drawn in co-operation with the standard committee of the Manganese Track Society, and were considered in conference with the committee on way matters of the American Electric Railway Engineering Association, and also with the American Railway Engineering Association committee on signals and interlocking. A number of plans were submitted for adoption as recommended practice of switch and spring rail frog details and bills of material for rails 6½ in. high and over. These plans, including the manganese crossings, were approved by the association.

Detailed specifications for track tools were presented.

Replies from 20 railroads regarding the limit of curvature on which rails are curved prior to being placed on the track led the committee to believe that the practice of pre-curving rail is gradually being discontinued, and to recommend that except on very sharp curves rails need not be curved before laying.

The conclusions reached by the committee with regard to the rerolling of rails is that there is no economy at the present high cost of doing this work, together with transportation costs necessary to move the rail to the mill and its return to points where it will be placed on the track. The resawing of rails for relayers is considered economical and is good practice, whether done by the company or the contractor. The committee stated that in its study of rerolling or resawing rails for relaying, it had concluded that the relative economies as between resawing and reconditioning rails or building up the joints in the track by acetylene, electric, or other processes is so interwoven that a study of the economies as between the two methods can best be made by a further study.

The committee presented a tentative table of dimensions for tie plates, both flat and canted. For use in track construction in and across paved streets and highways, the committee stated that the mills are prepared to roll girder rail sections 7 in. high and 9 in. high. Guard rail for curves, and straight guard rails are available in two sections 9 in. high and one section 7 in. high.

In the discussion the desirability of specifications for track tools was brought out, and it was stated that similar specifications for other material had assisted the railroads greatly in obtaining better quality. These specifications were adopted by the association, as were the recommendations for pre-curving of rails.

YARDS AND TERMINALS

The principal work of the committee on yards and terminals was the continuation of a study of the proper size and arrangement of large passenger station facilities, as determined by the business handled. Analyses were made of the movements of passengers, baggage and other material at terminals in order to determine the proper relationship between their size and arrangement, and the volume of business. The conclusions cover the time element in the discharge of passengers from cars onto platforms of various types and proper arrangements of stairways, ramps and platforms to insure separation of passengers from trucking operations. The report was approved for publication in the manual.

RAIL

The committee on rail proposed revised specifications for quenched carbon steel and alloy steel track bolts and quenched carbon steel joint bars. The committee stated that, continuing a study of rail manufacturing practices, it had secured chemical and physical tests on approximately 100,000 tons of high-silicon dead-setting steel. The record in general, it stated, shows a better quality of material in the dead-setting steel rail than in the average output under the standard specifications, without additional rejections or hardship upon the manufacturer.

The rail failure statistics were brought up to date. The comment was given that the 1917 rollings show an increase in the number of failures during the five years' service period, but it appears that this registers the peak of bad performance, and the better records of later rollings justify the hope that the banner record of the 1914 rollings will at least be equaled within the next few years.

The committee stated that it is not yet prepared to recommend a definite rail length in excess of the present 33-ft. standard for adoption as an alternate standard. A design for 150-lb. rail section was submitted.

A joint investigation of the underlying cause of transverse fissures is being carried on by several national bodies. It is believed by members of the rail committee that the tabulated data will serve to establish a predisposition of certain furnace heats toward failures of this type, and that progress in co-operation with the rail manufacturers may be made toward eliminating such heats from mill shipments.

The report of the committee was approved with minor modifications.

ECONOMICS OF RAILWAY LABOR

The attention of the committee on economics of railway labor was concentrated principally on the study of methods of obtaining and handling railway employees to promote continuity of service and efficiency in production. The outstanding feature of all data collected was the emphasis placed upon co-operation in industry, and that the recognition of the distinctive rights, responsibilities, and obligations of employers and employees has been the foundation on which all the plans rest. The duty of management is to provide means for the development and co-operation. This may be done by the adoption of methods which, by their natural workings in an organization, reflect the attitude of the managers. Methods to inspire co-operation automatically will not be a substitute for personality in management. Rather they will be aids providing channels for the constant expression of that relationship in industry so essential to the solution of the problem of the economic handling of labor.

The methods investigated by the committee were grouped under six headings. The conclusions with regard to the first, that of personnel, is that where roads are of sufficient size to warrant it a personnel department should be established. It should include (1) employment, promotion and transfer; (2) education, training and service, including foremen's training courses and apprentice systems; (3) discipline and separations from service.

The adoption of a plan of employee representation in management in railway work will, through the improvement of the spirit of co-operation, serve largely to stabilize labor and reduce the problem of obtaining new employees.

The extension of benefit associations providing insurance against the hazards of sickness, accident, superannuation, and death, is essential to the development of a loyal and co-operative spirit in railroad organizations. Saving funds and loan provisions placed at the disposal of all worthy employees are an added incentive of merit and of economic value.

The promotion of the mutual interests of employers and employees through participation in the ownership of the industry on which they are dependent is an objective greatly to be desired, the committee states, and warrants the special consideration of railways as a means for stimulating co-operation in the common objective.

Plans for the establishment of satisfactory working conditions, including the provisions of sanitary and agreeable facilities while on duty, comfortable rest houses, rest rooms and dining rooms, maintained in cleanly condition, and service of a sufficient quantity of wholesome food should be in effect on all roads, it is stated.

Incentive plans have been extensively adopted by industries covered by the committee's examination. The objectives were numerous, but in their aggregate were designed to avoid the waste due to absences, lateness and loafing, to develop interest and skill in the work, to increase production and to inspire loyalty and co-operation.

The establishment of standards and units of measure for all work performed which is susceptible of measurement is a fundamental basis of harmonious understanding between employer and employee, and the foundation for economical and efficient handling of labor.

The committee suggests for further examination and such use by individual companies as their judgment may determine of plans for guaranteed employment or unemployment insurance, and bonus payments for continued service, avoidance of lateness and absence, prevention of waste and other features of economic operation.

On the subject of standard methods for performing maintenance of way work, for the purpose of establishing units of measure of work performed, the committee concluded that (1) the making of time studies and the comparison of performances of an individual gang with a standard increases the efficiency of the gang under observation, and of other gangs which are made acquainted with the results; (2) the general use of standard methods and units of measure of performance on divisions and districts of a railway has resulted in increasing the efficiency of track forces.

The entire report was approved for publication in the manual.

MASONRY

Revisions of the manual proposed by the committee on masonry included definitions, specifications for stone masonry, specifications for constructing pre-molded concrete piles and specifications for driving pre-molded concrete piles. On the subject of design of concrete, plain and reinforced, for use in railroad structures, the committee made a preliminary report and presented a diagram showing proposed design load for culverts. In connection with the development in the art of making concrete, the year's work of the committee was devoted principally to a study of work being done in connection with various railroad projects. Reports on several of these were presented.

In the discussion there was some criticism of the diagram of proposed design loads for culverts presented by the committee, as it was felt that it was too conservative. It was pointed out in defense of the committee's report that, due to non-uniformity of pressure of the earth on the sides and top of the culvert, a sufficient margin of safety should be allowed. The revision of the manual was adopted and the remainder of the report received as information.

RECORDS AND ACCOUNTS

A detailed report was presented by the committee on records and accounts, in which numerous forms for analyses were given. A sub-committee also has been working as a part of a special committee under the authority of the American Railway Association, preparing a revision of the Interstate Commerce Commission classification of accounts. It was stated that a supplementary report will be issued separately covering this subject.

WOOD PRESERVATION

The committee on wood preservation stated that it has considered the possibility of making changes in the standard specifications for creosote, but that it was decided to retain the specifications as at present.

The committee continued its survey of treated ties which has been made for a number of years. It stated that although creosoted ties have been in use some 18 years none of those laid has as yet been approached an average life. Notwithstanding the incomplete state of the available data, it stated that certain fundamental conclusions may be drawn, which are briefly outlined as follows:

1. *Value of treatment*—The use of treated ties of one kind or another is not only an economic necessity, but an economic duty for all railways. In other words, none but treated ties should be laid, irrespective of climate or any other condition, except for such railways as still have available naturally long lived woods.

2. *Comparative value of treatment*—A study of the complete test records published to date indicates that definite figures as to length of life from different treatments cannot yet be given. The following, however, may be taken as a safe guide:

(a) *Zinc chloride treatment*—The committee adhered to its conclusion made in 1919 that the life of the most inferior untreated timber can be doubled by treating with zinc chloride, and in addition believed that a conservative estimate will place the life of ties treated with zinc chloride at from six to fifteen years, depending upon climatic conditions under which this type of treatment is used and the kind of timber treated.

(b) *Zinc creosote*—Depending upon climatic conditions the probable life of ties treated with this process may be placed at from 8 to 18 years.

(d) *Full-cell creosote processes*—Although ties treated by the empty-cell creosote processes have not been in track long enough as yet to give even a tentative figure, attention is called to the fact that in the most extensive experimental track laid in 1906, with pine ties treated with one of these processes, 96.2 per cent are still in tracks after a service of 17 years; on another railway, hardwood ties treated with another process of this kind, 89 per cent of ties laid in 1905 are still in tracks. It appears to be a safe conclusion that when properly treated a life of 16 years will positively be obtained, with a chance that this will run up to 25 years or more under proper maintenance conditions.

(d) *Full-cell creosote treatment*—Such ties have been removed in practically every case due to mechanical factors. It is generally recognized that the full-cell creosote process is not warranted at the present time, because mechanical life, under present conditions, will always be very much shorter than the life to be expected from decay.

3. *Choice of treatment*—It is stated that the choice of treatment should, in its first analysis, consist in comparing the life which is being obtained from ties in actual use and determining the annual charge against such ties, and then comparing this with the annual charge for ties treated by various methods. For example, if an untreated tie costs $1 and has four years' life, roughly figuring, the annual charge against such a tie is 25 cents. If such a tie be treated at a cost of 25 cents, one would have to obtain five years of life in order to have the same annual charge.

Summing up the committee presents the following conclusions:

1. Only treated ties should be used for permanent track construction, with the exception of a few durable woods.
2. Varying lengths of life may reasonably be expected for various types of treatments—zinc chloride, zinc creosote, empty-cell creosote and full-cell creosote.
3. The choice of treatment should be considered as a problem of risk in investment, as shown by probable annual charges.

SIGNS, FENCES AND CROSSINGS

Revisions in the specifications for spacing of anchor posts and wire fences, and in the specifications for highway grade crossings were presented by the committee on signs, fences and crossings. Specifications for bituminous crossings, and substitutes for wooden crossing planks; highway grade crossing separations; and economy of steel, wood and concrete fence posts were presented.

The work of the committee was done along the lines of standardized practice. This is in line with the work done by Secretary Hoover of the Department of Commerce in endeavoring to bring about a reduction in waste in various industries. A survey showed 552 styles of fencing manufactured and 2,072 sizes of packages marketed. Through a conference it was found possible to reduce the styles of fencing to be manufactured effective January 1 of this year to 69 and the sizes of packages to 138.

The revisions in the manual covering spacing of anchor posts and wire fences and the strength of wire fences were adopted and the remainder of the report accepted as information.

International Tramway and Bus Congress

THE technical sessions of the International Tramway and Bus Congress, to occur in Paris June 16-22, will be held in the large auditorium of the Institute of Civil Engineers of France, at 19 Rue Blanche. This congress is being held under the auspices of the Union Internationale de Tramways de Chemin de fer d'Interêt Local et de Transports Publics Automobiles. The program as announced is as follows: On Monday, June 16, there will be a registration of delegates at the office of the French Light Railway & Bus Association, followed by a reception in the evening at the Maison des Centraux.

The opening session will be held on Tuesday, June 17, at the Sorbonne, under the chairmanship of the Minister of Public Works of France, assisted by the president of the Municipal Council of Paris and other prominent officers of the municipality. The second session, at 2:30 p.m., and all subsequent sessions will be held in the auditorium of the Institute of Civil Engineers of France. At 5 p.m. on Tuesday, the delegates will be received at the City Hall by the Mayor.

Wednesday, June 18, will be given up to a trip to Versailles, Saint-Germain and Saint Cloud. In the evening at 8 o'clock, the delegates will be guests at a banquet tendered by the French Light Railway and Bus Association.

There will be two technical sessions of the association on June 19, one at 9:30 a.m. and one at 2:30 p.m.

The fifth and last session of the association will be held on the morning of June 20.

Owing to the demand for hotel space in Paris, the secretary of the association at 15 Avenue de la Toison d'Or, Brussels, will afford assistance.

Annual Meeting of New York Electric Railway Association

THE date for the annual meeting of the New York Electric Railway Association has been set for Saturday, June 21. It will be held at the Nassau Hotel, Long Beach, L. I., one of the most attractive shore resorts near New York City. Golf, surf bathing, and other recreations are available.

There will be a one-day session, with a business meeting in the morning, recreation features in the afternoon, and the usual annual dinner in the evening. A detailed program will be announced later.

Wisconsin Utilities Meeting

THE Wisconsin Utilities Association will hold its annual convention at Milwaukee, Wis., on April 17 and 18 at the Hotel Pfister.

Among those who appear on the program will be Halford Erickson, Chicago; F. R. Coates, Toledo; S. B. Hood, Minneapolis; Adolph Kanneberg, Andrew MacDonald, C. B. Hayden, and H. H. Wilson of the Wisconsin Railroad Commission; John A. Hoeveler of the Industrial Commission; O. L. Kowalke, James T. Rood, Edward Bennett and R. T. Ely of the University of Wisconsin.

British Meeting Postponed

THE dates for the next annual conference of the Tramways and Light Railways Association of Great Britain, which is to be held in Edinburgh, have been altered from June 26 and 27 to July 3 and 4.

Date Changed for C. E. R. A. Meeting

THE summer meeting of the Central Electric Railway Association will be held at Cedar Point, Ohio, on July 17 and 18.

The change in the dates for this meeting is necessary on account of the fact that several other conventions will be held at Cedar Point during the week of July 6.

American Association News

Electric Railway Men Present Case on Section 15a

Statements Made by Seventeen Companies and Appearances by About Sixty Representatives at Interstate Commerce Commission Hearing as to Application of Recapture Clause to Electric Lines

THE electric railways had a hearing before the Interstate Commerce Commission in Washington on March 19 to present their views on whether Subsection C of Paragraph 1 of Section 15a of the Interstate Commerce Act as amended Feb. 28, 1920, known as the "recapture clause," should be interpreted to include them. Commissioners Meyer and Potter were sitting.

The case for the electric railways was conducted by Charles L. Henry, chairman of the national relations committee of the American Electric Railway Association. Mr. Henry said briefly that whether Section 15a applied to the electric lines depended upon the interpretation of the clause, "engaged in the general transportation of freight." He then presented a statement prepared for the committee by C. D. Cass, Waterloo, Ia., which summed up the position of the electric lines. This statement is given in full later.

Mr. Henry called Mr. Cass to the stand to present statements for two Iowa roads, the Waterloo, Cedar Falls & Northern Railway and the Des Moines & Central Iowa Railway. These statements were for roads which were considered as clearly subject to the provisions of Section 15a.

W. H. Sawyer then presented a statement for the five companies operating in East St. Louis, Ill., and vicinity, of which he is president, these companies being cited as typical of those interpreted to be clearly without the provisions of the act.

R. R. Bradley, who appeared for the Chicago, North Shore & Milwaukee Railroad, was next called to the witness stand. He sought to show also that his road was clearly without the provisions of the act.

Other statements were made by Arthur W. Brady, Union Traction Company of Indiana; Frank Karr, Pacific Electric Railway; C. S. Burlingham, Wheeling Traction Company; Robert P. Woods, Kansas City, Clay County & St. Joseph Railway; William Chamberlain for the Grand Rapids, Grand Haven & Muskegon Railway and the Clinton, Davenport & Muscatine Railway and three other Iowa interurban lines; Robert R. Quirk for the Chicago, Aurora & Elgin Railroad; J V. Norman for the Interstate Public Service Company; Frank R. Ford and Wilbur LaRoe for the Lackawanna & Wyoming Valley Railroad; John W. Shartel, Jr., Oklahoma Railway Company; Henry I. Green, Illinois Traction System; J. R. Whiting, Michigan Railroad and two other Michigan lines, and William G. Fitzpatrick for the Detroit United Lines.

The statement presented by Mr. Henry, previously referred to, follows:

THE PLATFORM OF THE ELECTRIC RAILWAYS

In the mind of Congress, when the Transportation Act of 1920 was written, the exclusion phrase (c) "or engaged in the general transportation of freight" must have had some relation to a general or common understanding of what those words meant. Some definite condition in the rail transportation industry of this country was the guide which directed Congress in the use of those inclusion words as applied to the electric interurban lines. Let us see if we can find this guide.

From the establishment of rail transportation steam railroads had been the common commercial carriers of the country—exclusively—until a very few years prior to the enactment of the Transportation Act of 1920. At that time—and for a few years previously—there had come into being a very few independent electric commercial carriers. The steam railroads also were operating an ever-extending portion of their own roads electrically, and in dealing with the general railroad subject comprehensively, as was intended by the Transportation Act of 1920, it was necessary to consider these comparatively new electric carriers and assign to them a definite position under the act, by some designated language that would fairly and properly classify them with the commercial steam carriers of the country. The language "or engaged in the general transportation of freight" was finally used as descriptive of a certain definite condition prevailing upon America's steam railroads, and where electric carriers' conditions corresponded, they became amenable to Section 15a—otherwise not.

Now, then, what does that phrase mean—"engaged in the general transportation of freight?" Let us take an illustration. Suppose you go to *any station* on *any steam railroad* at *any place* in this country and you say to the agent: "I have a carload of horses —a bushel of turnips—20,000 ft. of lumber—a gas stove—and a tank car of gasoline I want to ship to any town, *any place* on *any other steam* railroad in America." What does the agent say? He says: "All right, mister, we will spot the cars for your carload stuff to-morrow, and you can deliver the l.c.l. at our freight house or room any time." In other words, you can make this shipment from any steam railroad station in the United States to any other steam railroad station in the United States at any time you desire, assuming that the freight equipment is immediately available.

But suppose, instead of going into a station on any steam railroad, you go into the Highland Park station, or Glencoe, or Lake Forest, or any other station on the Chicago, North Shore & Milwaukee electric line—or into any other station on most electric railroads in this country, and you put the same proposition up to the agent of the electric railroad, what will he say? Unless it happens to be on one of the few commercial electric carriers in this country—the agent will say: "Why, mister, we haven't any facilities for handling those goods. We could accept your bushel of turnips and your gas stove, and send them by express—but we couldn't handle any of the balance of those goods."

Or on some electric roads the agent might say: "We can load your horses and take them up to Xtown, where you can unload them and put them in a steam road freight or stock car." Or he might say any one of a dozen or more other things which would indicate either an impossibility or a restricted ability on the part of the electric line to furnish transportation for the proposed shipment. In any event, on most electric interurban railroads this shipper would receive an entirely different answer from that received had he tendered the shipment to any steam railroad station anywhere in America. On some few electric carriers in this country this shipper would receive the identical answer he would receive from any steam railroad agent, and as to these electric railroads there can be no question concerning their status under Section 15a. But, obversely, is it not consistent, then, to determine that any electric railroad, handicapped in its handling of freight by any one or more impediments sufficient to eliminate it from the term "general transportation," is *not* amenable to said section.

The word "general" cannot be interpreted to mean "restricted"; and, per contra, the word "restricted" cannot be construed to mean "general."

Most electric railroads have peculiar characteristics as compared to steam railroads. Their physical facilities are not susceptible of being used by steam road equipment, except in a limited way. If freight is handled at all, it is usually handled in cars built especially to conform to the physical conditions of the road. Such conditions involve clearances and weight limitations—trucks and drawbars designed to negotiate short radius curves, etc., and where physical limitations are not enough to furnish good handicaps, then city ordinances finish the job with legal handicaps, such as requiring freight to be handled between the hours of 12 o'clock midnight and 6 a.m., or prescribing that no cars containing livestock may be transported over city streets. Any electric railroad subjected to these handicaps, either physical or legal, cannot properly be classed with steam railroads in their performance of freight business, even though such road does as a matter of fact handle a large volume of some special commodity like rock or sand or coal over some particular section of its line.

There is another angle to this subject that merits some attention. The inclusion words "engaged in the general transportation of freight" are purely descriptive. Nothing is contained in their meaning that lodges with the commission any power other than to determine whether a given road is or is not so engaged. It might well happen that although a given road was not subjected to either physical or legal handicaps, such road had decided, in its own wisdom, to restrict or limit its freight handling to a certain commodity or commodities, and while not "engaged in the general transportation of freight," there were no limitations in its freight handling ability, except its own definite and well considered policy. We submit that in such a case, even, your honorable commission could not at this time, and without other and additional action, legally determine that such road was amenable to Section 15a. It is granted, however, that by appropriate action in such case your honorable commission might require the filing of such tariffs and routes and divisions with other commercial carriers as would bring the given road within the purview of roads subject to the provisions of Section 15a. We are here in this case dealing, however, with a road having no physical or legal handicaps. As to a road under similar conditions, surrounded by physical and legal handicaps, it is our judgment that such road could never be legally required to place its facilities in condition to "engage in the general transportation of freight."

Summing up, then, it is obvious that any electric interurban railroad which could not accept a shipment of freight at any of its stations, such as was suggested in the typical illustration, could not be considered as amenable to Section 15a. And, further, that although a given electric interurban railroad does, in fact, transport a large volume of freight over a particular section of its line, or does, in fact, handle a large volume of some special commodity like sand or rock or coal—yet this fact, in itself, cannot justify a finding that such road is thereby classified with the commercial steam railroads of the country which were in the mind of Congress when it laid down its rule "engaged in the general transportation of freight." These words are *only* descriptive of the type of electric roads that Congress was holding within the provisions of Section 15a, and they must have some relation to the common or general understanding of conditions on steam railroads that brought about the use of such words.

AN ELECTRIC RAILWAY WITH INTERCHANGE AMENABLE TO ACT

In his statement for the Waterloo, Cedar Falls & Northern Railway, C. D. Cass showed that 36.9 per cent of the total revenue of the company was derived from freight. The company has direct physical connection with four main-line steam railways and indirect connection with four others through universal switching arrangements. A general railroad business is performed by the company, all classes of freight and passenger business being interchanged with practically all of the trunk line railroads in the United States. Through tickets are sold and through freight is routed to and with all other railroads in the country. The revenue from interchange freight business with other railroads constitutes 76.20 per cent of the total freight business of this company.

The company owns standard interchange steam railroad freight equipment to the extent of 120 box, flat, stock and coal cars. It has no freight cars which are not susceptible to interchange with steam railroads. Substantially all of the freight business of the company is performed on tracks located on private rights-of-way. It has full and complete lines of tariff with all steam railroads in the United States and is a joint party to all joint tariffs in its territory. There is no difference in the conduct of the business of this company from the conduct of the business of a steam railroad except that the power used is electric instead of steam. The company is a member of the following steam railroad associations: American Railway Association, Railway Accounting Officers' Association, Freight Claim Association, Western Weighing and Inspection Bureau, Association of Railway Executives and Chicago Claim Conference.

Mr. Cass maintained that his railroad is engaged in the general transportation of freight within the meaning of subsection C of paragraph 1 of section 15a as it handles as completely as any other railroad a general transportation business, and therefore considers itself amenable to Section 15a.

EAST ST. LOUIS COMPANIES SHOWN NOT TO BE UNDER THE ACT

W. H. Sawyer, in presenting a statement for the East St. Louis & Suburban Company and its five subsidiary railways, endeavored to show that his companies clearly were not engaged in the general transportation of freight. He showed that 113 miles of the total 191 miles of track owned by the company are on county highways and streets. The company has physical connection with seven steam railways, some of which are practically never used. Certain business is interchanged with steam railroads, the principal item being coal. The movement is almost wholly in one direction, namely, from the electric line to the steam lines. The companies' total freight revenue, including package freight, is about 13 per cent of its total revenue. While 814 coal cars are owned, no other type of freight car is owned and no interchange business with steam railroads is solicited because the company is in no position to handle it. The hauling of coal or other carload freight through cities and villages is generally prohibited, and the construction of track is such that standard freight cars cannot be handled except over a small portion of the lines.

Mr. Sawyer then undertook to define the meaning of the word "general" and from that to interpret the meaning of the clause "engaged in the general transportation of freight." The dictionary shows that "general" means "pertaining in common to all; widespread or prevalent; large or unlimited in scope; not restricted in application; viewed altogether as a whole; customary." He said that the antithesis of "general" is "exceptional," "unusual," "peculiar." The word "general" means general, not restricted. He said his companies are not in the general transportation business because they do not transport all kinds of goods. A much used synonym of "general," he said, is the word "universal"; others are "normal," "prevalent," "usual" and "customary." "General" applies to all with possible or comparatively slight exceptions; "universal" applies to all with no exceptions. These are the definitions as shown by the dictionary. Substitute any synonym in the dictionary, he said, and immediately it becomes apparent that "general transportation" does not apply to the East St. Louis companies. These companies have not only exceptions to general transportation, but the exceptions are the rule. They are not engaged in the general transportation of freight, but in a most restricted transportation of freight.

Maintaining that the Chicago, North Shore & Milwaukee Railroad did not come under the provisions of Section 15a, Judge Bradley showed that for the ten months ended Oct. 31, 1922, the revenue for carrying all kinds of property was $598,215, while only $75,848 of this was from carload freight, the balance being from merchandise dispatch and express. During the same period, the revenue of the company from passenger service was $3,411,285, showing the great preponderance of the passenger business as compared with the freight business of the company. The North Shore Line has no through freight rates with any steam railroads except the Elgin, Joliet & Eastern Railroad, known as the Chicago Outer Belt Line, and its through-rate agreements with that road are limited to the carriage of sand and gravel, slag, coal, coke, cinders, brick and cement. In all cases of interchange, whether originating on the North Shore Line or received from connecting lines, the cars for such service are furnished by the connecting line and movement is restricted to that part of the North Shore Line between Highland Park, Ill., and Harrison Street, Milwaukee. There is no interchange of l.c.l. freight with connecting steam railroads.

A point made by Judge Bradley and presented also by Mr. Henry and Mr. Brady was that the average cost of money to the electric line at the present time is about 8 per cent. Judge Bradley said that the average cost to the North Shore Line on money borrowed since Jan. 1, 1917, has been 8.30 per cent, and that a careful survey of capital requirements and of the company's ability to borrow, shows that it will be unable to get new money for a period of years for less than 7 per cent. The electric railway men undertook to show that if the cost of money to them was around 8 per cent that it would be fatal to them if their earnings in excess of 6 per cent were to be partly taken through a ruling of the commission.

Judge Bradley showed also that the North Shore line owns 109 miles of track, of which 41 miles is so restricted by its location in public streets, by franchise agreements, by its leases of property of other roads, and by the physical construction of its own and leased property, that it cannot handle carload freight or standard steam railroad equipment.

Equipment

A MEETING of the equipment committee of the Engineering Association was held at Pittsburgh, Pa., on March 17 and 18. Those present were: F. H. Miller, chairman; Daniel Durie, sponsor; W. S. Adams, R. S. Bull, A. T. Clark, J. L. Gould, J. M. Hipple, J. F. Miller, M. O'Brien, E. D. Priest, E. S. Sawtelle, P. V. C. See, R. B. Smyth, and W. G. Stuck.

The various subjects assigned to this year's equipment committee were taken up and discussed, and decisions were reached on many points for incorporation in the report of the committee. To obtain information on the use of helical gears, a data sheet has been sent out to the various users, and detailed information is being received. This will be tabulated for the next meeting. The matter of standardization of web holes in gears was discussed at considerable length, and the matter is to be taken up with the Gear Manufacturers' Association, in order to obtain additional information. The committee studying trolley contact devices reported that a questionnaire had been sent out, but replies had not started to come in yet.

Substantial progress has been made in revising various miscellaneous methods and practices for improvements in the Manual. Substantial progress is being made on these reports. The study of spring supports for railway motors is to include information from various companies, but sufficient replies have not yet been received to tabulate.

A detailed report was made on revisions necessary in the various equipment standards. Changes have been recommended for a total of twelve standards and specifications by this year's committee. Of this number, definite recommendations were arrived at for six, and the work on the remaining six has advanced so that definite decision can be reached at the next meeting of the equipment committee, which will be held in New York on June 6 and 7.

Monday evening the committee members were guests of the Pittsburgh Railways, the R. D. Nuttall Company, the Westinghouse Traction Brake Company and the Westinghouse Electric & Manufacturing Company at a dinner given at the Union Club, followed by a theater party.

Tuesday was spent inspecting some of the manufacturing plants in Pittsburgh under the guidance of representatives of the above companies. The members left the Fort Pitt Hotel at 9 a.m. on the two-car six-motor train of the Pittsburgh Railways and visited the works of the R. D. Nuttall Company, from where they went by auto to the Homewood carhouse of the Pittsburgh Railways, and then for luncheon to the Lunch Club of the Westinghouse Electric & Manufacturing Company at East Pittsburgh. After lunch an inspection was made of the East Pittsburgh works of that company and of the Westinghouse Traction Brake Company works at Wilmerding.

Buildings and Structures

A MEETING of the buildings and structures committee of the Engineering Association was held at Cincinnati on March 17. Those present were N. E. Drexler, chairman; J. D. Kent, B. R. Brown, Judson Zimmer, J. R. McKay, E. D. Eckroad, W. H. Stamm and T. H. Stoffel. The meeting was devoted principally to a discussion of progress reports of the sub-committees.

A sub-committee on passenger terminals is to study a number of the more important electric railway terminals as examples of present practice. The sub-committee is to prepare general recommendations on important points in terminal design, such as ramps, subways to avoid crossing of tracks by passengers, adequate capacity and architectural appearance.

The sub-committee on freight terminals for city and interurban service is to obtain plans of several typical electric railway freight station layouts and prepare a suitable questionnaire to obtain further data. The final report is to include plans of several layouts giving data as to number of cars that can be handled, capacity in tons, cost of handling, etc. Combination terminals will also be studied.

Designs of buildings for proper storage and maintenance of buses is also to be considered in the committee's report. It is planned to stress the importance of proper precautions for taking care of carbon monoxide gas, for the storage of gas and oil, proper fire protection and pleasing architectural design.

Akron Publicity Material

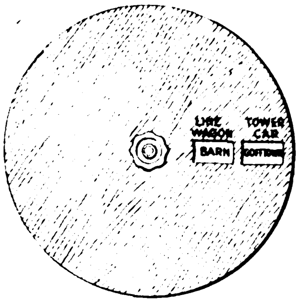
THE Committee of One Hundred of the American Electric Railway Association is distributing a leaflet on the Akron bus situation, giving in a few words the results of the bus service and reasons that impelled the public to demand the return of the street car service again.

It is also distributing a broadside containing reprints of articles and editorials on the plight of the Rubber City.

Maintenance of Equipment

Indicator Tells Location of Emergency Wagon

ON THE wall of the carhouse of the Manchester Street Railway Manchester, N. H., a novel type of indicator has been installed to tell the location of the emergency wagon and the line car. This is done by the movement of two circular disks on which are listed the names of the various railway lines. The disks are of different diameters. There is one opening through the face of the apparatus near the circumference of each disk. Through these openings the names of the routes are read. Before the line wagon or emergency truck leaves the carhouse its driver sets the indicator to show where he has gone. When he returns the indicator is set back to read "Barn."

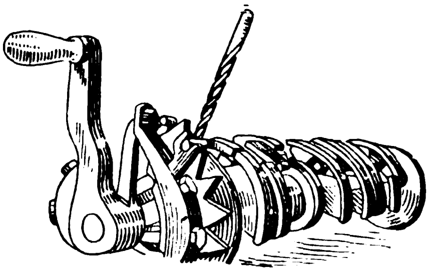


The Names Read Through the Openings Tell the Locations of the Emergency Wagon and Car

Locating Star Wheels on Controller Shafts

THE United Electric Railways, Providence, has adopted a star wheel for its controller shaft of a design different from the ordinary. The chief feature of this wheel is that it has a more pronounced tooth at the point of change from series to parallel, thus accelerating the rotation of the controller shaft at this point. It is the practice of the company to immediately install its own star wheels as soon as new controller shafts are received from the manufacturer.

Accurate locating of the star wheel in relation to the controller handle and to the broached portion of the shaft is important. In order to facilitate this work and secure accuracy, a jig for boring the star wheel in position has been devised. A standard controller handle is used with an attachment fitting into the notches of the star wheel. The wheel is thus held in its proper position in relation to the controller shaft. The outside portion of this attachment has a hole accurately located for drilling.



Jig for Locating Star Wheel

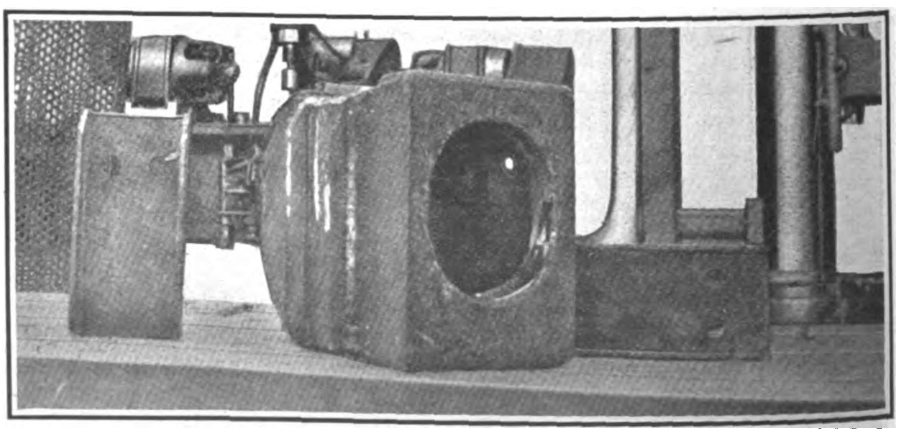
Renewing Journal Box Pedestal Guides

DUE to the spring support between the truck frame and journal boxes movement takes place constantly between the pedestals and the sides of the journal box. On some old-style trucks no provision was made for wear plates, and so the repair of the journal box pedestal guides must be done by building up the worn surfaces by electric welding, or else renewing these entirely.

The Philadelphia & Western Railway, Norristown, Pa., is welding mild steel wearing plates to its journal boxes. This has proved a very satisfactory construction. These wearing plates are of ¼-in. stock, bent to shape, and when finished are 6 in. wide by 8 in. high and of a channel section. The journal boxes have a recess planed for them to fit in and to give clearance for the welding metal and then they are welded firmly into position, which is done around the edges of the plate. In addition to this the plate is anchored to the journal box by welding to fill two holes drilled through the plate.

The accompanying illustration shows a journal box which has been planed out to receive the wearing plates, and the two plates ready for application. The two plates are clamped in place during the welding operation, which takes about one-half hour. As the plates are of finished stock, forged accurately to shape, no inside machining of the wearing plates is necessary after they are welded in position.

The practice of the railway also is to add material to the opening in the journal box for the axle at the dust guard seat. With any wear on the outside of journal bearings there is a tendency for these to rotate slightly inside the journal box with every application of the brake. This forces the axle over toward the side of the journal box, and eventually there is rubbing between the axle and the journal box at this point. This wears out the opening provided for the dust guard, and in some cases also wears a groove in the axle. This rubbing between the journal box and the axle is sure to cause heating, and in some cases results in hot bearings.



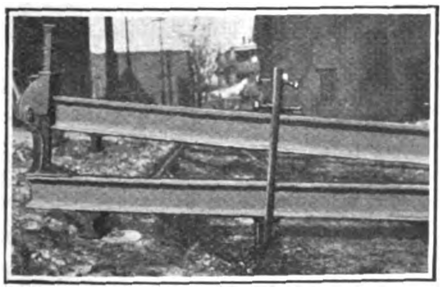
Journal Box Machined Ready for Welding in Wearing Plates

In order to bring these openings back to their normal dimensions, and also to provide a proper surface in case the journal boxes happen to rub against the axle at this point, a $\frac{3}{8}$-in. square wearing plate is welded in. Metal is also added to the opening so as to make a proper fit. Since this construction has been used, the number of hot bearings has been reduced from an average of eight or ten per month to less than one per month. The grinding out of the inside of the journal box opening after metal has been applied by welding is accomplished through the use of a hand grinder with an extended spindle. This makes it easy to get inside of the journal box and provide a proper bearing fit.

In order to prevent rapid wear of the journal bearing sides, a steel wearing plate is screwed onto one side of the bearing. This is anchored in place by brazing, and the screw heads are also prick punched to prevent their working loose.

Eight to One Leverage for Straightening Rail Joints

By a skillful application of levers the maintenance of way department of the Springfield Street Railway, Springfield, Mass., obtains a pressure of 120 tons for straightening battered rail joints with a 15-ton jack. The lever arm is a piece of 7-in., 103-lb. grooved rail, 7 ft. 6 in. long. A collar composed of pieces of 3-in. by 1-in. steel encircles the lever arm and passes underneath the joint to be straightened. An ordinary hand jack is then placed under one end of the lever. The relative length of the arm can be varied, with a ratio of 8 to 1 as a maximum. The 15-ton force of the jack can thus be multiplied into a pressure of 120 tons exerted on the joint. Welded joints are straightened in place simply by removing the surrounding pavement and placing the collar underneath the joint. Convenient handles have been welded to the upper rail to aid in carrying it from place to place.

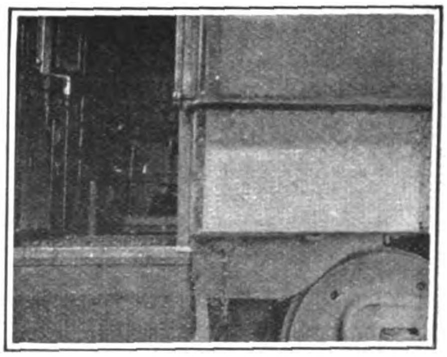


The Collar Is Placed Around the Joint to Be Raised and Pressure Applied by Means of the Jack

Galvanized Sheeting Protects Car Sides

The practice of re-covering the lower side panels of its cars with galvanized steel sheeting has been adopted by the Middlesex & Boston Street Railway, Newtonville, Mass. This is done in short sections as shown in the accompanying illustration. Whenever a car is brought into the shop for overhauling examination is made of the condition of these lower side panels and when they are found to be in poor condition this sheeting is applied. An important saving is accomplished because the wood panels originally used were very prone to split after having been steamed and bent to fit the curved sides of the car.

No serious trouble has been experienced with rust, nor has there been any difficulty due to water seeping in around the edges of these galvanized pieces. Painting, which is very carefully done, consists of one coat of primer, one coat of flat color, one coat of enamel and one coat of finishing varnish. This is the normal painting procedure on the Middlesex & Boston Street Railway and has been found to afford adequate protection to these panels. Cars are brought into the shop and repainted on the average every two years.

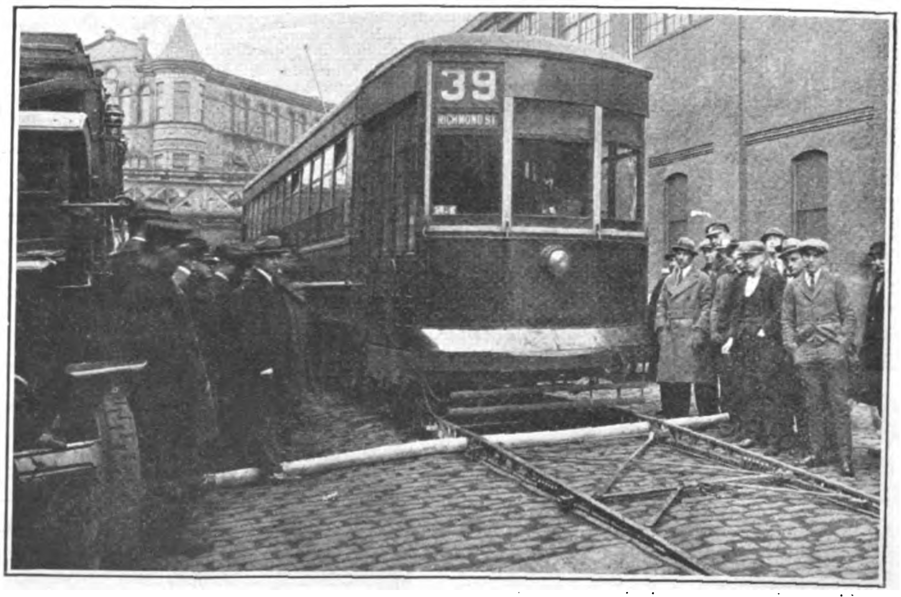


Galvanized Steel Panels Are Used to Protect the Woodwork on the Cars of the Middlesex & Boston Street Railway

New Equipment Available

Special Fire Hose Bridge Used in Philadelphia

A new type fire hose bridge has recently been adopted by the Philadelphia Rapid Transit Company. The design was worked out in collaboration with the Ohio Brass Company, and differs from types previously used in that it is longer and has a more gradual slope. The development of the high-pressure water supply system for fire protection was an important factor in creating a need for this apparatus. So long as the low-pressure system was in general use in the city, it was possible for the railway to lift the lines of hose over its tracks and support them on its tower wagons. A high-



The Gradual Slope of the Hose Bridge Facilitates the Passage of Cars pressure hose, however, is too lively to be treated in this way and it was necessary to adopt other means of keeping the cars moving.

The track layout in Philadelphia is such that a fire anywhere in the downtown district is likely to necessitate the laying of hose across the rails. An old-fashioned fire hose bridge was unsatisfactory because of the steep slope, and for that reason a new steel bridge was designed. It is 26 ft. long and weighs 500 lb. The bridge is built in four sections which can be assembled in less than five minutes. Nine more of the same kind have been ordered. They will be carried on all the emergency wagons of the P. R. T. One wagon is located in each district of the city, and responds to every fire alarm in its district.

Combination Woodworker with New Features

RECENT features added to the Combination Woodworker No. 2, manufactured by the Buffalo Forge Company, Buffalo, N. Y., include a change in the planer guide arrangement to provide for quicker and more accurate adjustment. A positive drive for the ripsaw and jointer mandrel have also been added. The drive is by means of a rawhide pinion and gear.

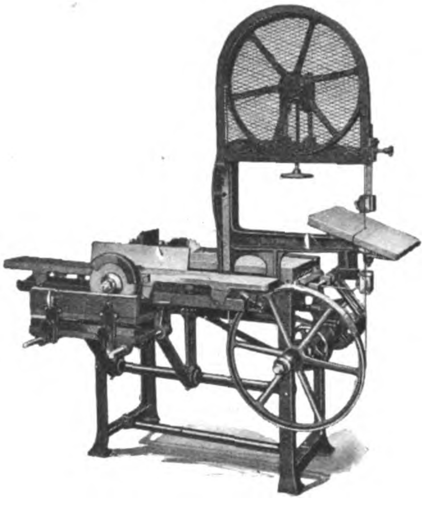
The new planer guide arrangement provides for moving the planer guide forward and backward in a slot or groove. This guide is locked in position by means of a thumb nut. The older type used a two screw adjustment and did not have the slide arrangement. This guide can also be set at any angle desired for beveling purposes.

The former method of drive has been replaced in the new woodworker by a positive drive of the pinion and gear pulley type, which makes a smooth running machine and eliminates belt slippage. The gear ratio of the two pinions is approximately 2 to 1. The pulley pinion is cast in one piece, while the main shaft pinion is keyed to the shaft.

Other important features of this new machine consist of tight and loose pulleys, 8 in. x 3 in., and a handy belt shifter.

The table for the crosscut saw and ripsaw is 37 in. x 15 in. wide, and is made of heavily ribbed cast iron. The table is hinged at one end and can be raised or lowered to adjust the depth of the cut. A cast-iron crosscut guide is furnished with the machine, which slides in a milled groove in the table and is adjustable for varying angles.

The jointer fastened on the same spindle as the saw is 6 in. long and 3 in. in diameter. A screw and hand wheel arrangement is used to make both sides of the jointer table adjustable. The jointer shaft has an outboard bearing and outside of this is an 8-in. x ¾-in. emery wheel. A ½-in. reamed hole in the shaft end and a tap for a headless set screw allows straight shank bits to be inserted.



Woodworker with Positive Drive Ripsaw and Jointer Mandrel

In order to facilitate the holding of work to be drilled, a slide table is provided which is readily adjustable to different heights. An 18-in. disk sander may be placed on the lower bandsaw shaft. The bandsaw wheels are 22-in. diameter by 1½-in. face, and are covered by an endless rubber band which reduces slippage of the saw.

Switchboard Instruments

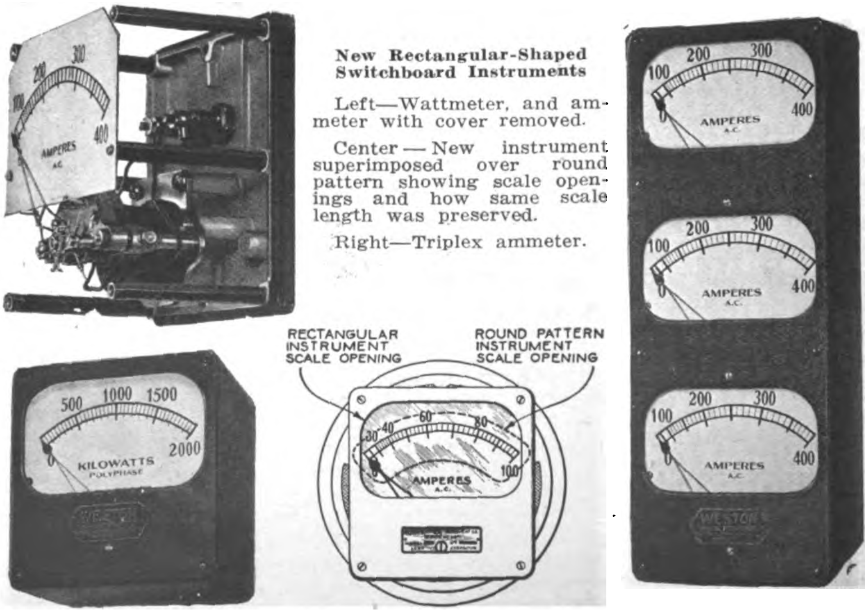
A COMPLETE line of rectangular-shaped instruments, including direct-current voltmeters and ammeters, for use on switchboards controlling alternating-current machines has been developed by the Weston Electrical Instrument Company, Newark, N. J. All the instruments of the group have uniform case size dimensions—5¾ in. wide and 6 in. high.

Four of the rectangular type of instruments may be laterally accommodated on a 24-in. panel, whereas the round pattern instruments require a 32-in. panel and a greater vertical space. A triplex ammeter, as shown in the illustration, contributes to the saving in space where an ammeter is required in each phase.

Although the new instruments occupy a much smaller space, reference to the illustration shows how it was possible to preserve exactly the same scale length as in the round-pattern instruments. Further, there has been obtained a much larger scale opening, permitting better illumination and improved legibility, which is also facilitated by larger and heavier scale numerals printed on a horizontal plane.

The wiring studs in the rear of the instrument have been grouped in the center and have been kept uniform on all types. The resistors, where used, are mounted back of the switchboard on studs projecting from the rear of the instrument. These resistors have also been made smaller.

These meters are suitable for substation panels and other uses in the railway field.



New Rectangular-Shaped Switchboard Instruments

Left—Wattmeter, and ammeter with cover removed.

Center — New instrument superimposed over round pattern showing scale openings and how same scale length was preserved.

Right—Triplex ammeter.

The News of the Industry

Legislation to Regulate Motor Vehicle Fails in Oklahoma

All measures were killed that were proposed in the recent extra session of the ninth Legislature of Oklahoma to protect existing electric and steam railways from cut-throat competition by buses and trucks, by compelling the latter to conform to the regulations imposed by the state on carriers of other classes, and by imposing a tax upon motor transportation that would in a measure compensate for their use of the public highways. In the meantime the Corporation Commission continues to grant permits for the operation of motor transportation lines, both freight and passenger, many such permits being for lines which will be in direct competition with existing facilities. The commission is made the judge of the necessity for the service for which application is made, and by the granting of permits to lines competing with existing facilities in effect holds such facilities to be inadequate to the public demand for service.

Pennsylvania Extends Philadelphia Electrification

An extension of the electric service of the Pennsylvania Railroad on its Fort Washington branch was placed in service on Feb. 27. This is a branch about 6 miles long, extending from the Chestnut Hill line to White Marsh. It is equipped with the same general type of electrification as that now in service on the Chestnut Hill branch.

Maine Commission Announces Bus Regulation

Rules and regulations governing the operation of motor vehicles used for the carrying of passengers for hire over regular routes upon any public street or highway within the state of Maine, were announced recently by the Public Utilities Commission to become effective on April 1.

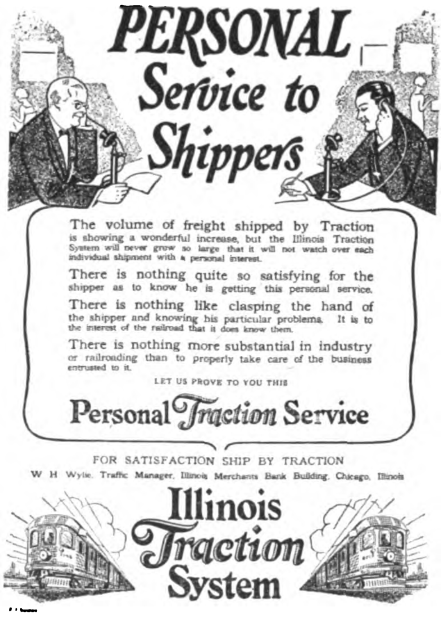
The rules which apply to any automobile, automobile truck or trackless motor vehicle require that a certificate from the Public Utilities Commission be obtained, the application to give the name of the owner, the make of the motor vehicle, seating capacity, rated horsepower, factory number, state license number, where the motor vehicle is to be operated, the fares to be charged, the time of leaving designated points, and the names of any other form of transportation with which the application may compete.

In addition to the mechanical requirements the operating schedule of the vehicles must be maintained and none of them will be allowed to carry passengers in excess of the rated seating capacity. The vehicle must also be stopped before crossing the tracks of any steam or electric railroads at grade.

All rates of fare and practices are to be subject to the approval of the Public Utilities Commission.

Ship by Traction Urged by Illinois System

The Illinois Traction System, Peoria, Ill., is running in *Traffic World*, the St. Louis Chamber of Commerce magazine, a series of advertisements describing its freight activity. The advertisements are the medium of a message to the shippers, the message being that traction is the new field for nation-wide shipments, and that it guarantees personal service, standard equipment, steam line connections, and joint through rates. Under the slogan "for satisfaction ship by traction," W. H. Wylie, the traffic manager, tells the shippers that he wants to prove to them what the personal traffic service is. One advertisement shows the increase in the volume of freight shipped by traction. Another ad gives the territory of the Illinois-St. Louis field for the shipper and the manufacturer. Still another describes the complete carrying facilities of the traction system, which "gives effective accommodations to shippers of all classes of commodities," explaining the switching arrangements with other carriers that make it possible to reach all industries in St. Louis, East St. Louis, Peoria and other points in traction territory.



The volume of freight shipped by Traction is showing a wonderful increase, but the Illinois Traction System will never grow so large that it will not watch over each individual shipment with a personal interest.

There is nothing quite so satisfying for the shipper as to know he is getting this personal service.

There is nothing like clasping the hand of the shipper and knowing his particular problems. It is to the interest of the railroad that it does know them.

There is nothing more substantial in industry or railroading than to properly take care of the business entrusted to it.

LET US PROVE TO YOU THIS

Personal Traction Service

FOR SATISFACTION SHIP BY TRACTION

W H Wylie, Traffic Manager, Illinois Merchants Bank Building, Chicago, Illinois

Illinois Traction System

Typical Ad Showing Facilities of Electric Line

Philadelphia Rapid Transit Must Pave in Swarthmore

The Philadelphia Rapid Transit Company, Philadelphia, Pa., lost its case recently when the State Supreme Court ordered the company to comply with the terms of a franchise calling for the paving of Yale Avenue from curb line to curb line in the Borough of Swarthmore and the township of Nether Providence, Delaware County. The Borough of Swarthmore some years ago granted a franchise to a railway to operate over Yale Avenue. Subsequently the Philadelphia Rapid Transit succeeded to the other company's rights. A provision in the franchise called for the keeping of Yale Avenue in good repair by the railway. Increased use of the avenue by automobiles resulted in damage, and the borough notified the Philadelphia Rapid Transit to fix the roadway. Upon complaint to the Public Service Commission that body ordered the company to repair "only that portion of the highway occupied by its rails and ties." The Superior Court reversed the ruling of the commission and the case was then appealed to the Supreme Court.

9,000 Pass Users in Fort Wayne

How popular the weekly pass has become with the public using the lines of the Indiana Service Corporation in Fort Wayne in just two years is shown by the fact that from a first week sale of 2,967 now practically 9,000 passes are issued each week. When the idea of issuing a weekly pass was conceived in Fort Wayne the officials of the local corporation had little more than the history of the pioneer Racine installation to guide them, but, by careful management and widespread advertisement the system immediately grew in favor. As a result thousands of passes are now being sold weekly to shopmen and others who otherwise would probably have continued to use the cars sparingly at the regular fare of 7 cents cash or 6½ cents token. To many of these persons the use by them of the pass has meant the possibility of from four to six rides every day, warm lunches and some time away from the factories and shops and all at a cost of only 14 cents daily.

The economy in the use of the pass was immediately impressed upon the shop and factory workers as well as those in downtown offices and stores through a system of newspaper and car advertising and as a result the sale of passes at $1 each mounted until now the 10,000 mark appears at hand.

As a result of the careful study of the weekly pass privileges it has been found that the average fare per revenue passenger has been reduced from 7 cents of two years ago to 5 2/5 cents for the second year of pass usage. More than 20,000,000 passengers were handled on the city lines in Fort Wayne during 1923 and it is expected that this figure will be exceeded by more than 5,000,000 during the present year through greater use of the pass.

Jitney Men at Houston Seek Court Intervention

Seven jitney drivers at Houston, Tex., through their attorney, have filed a petition in the District Court asking that the city be enjoined from enforcing the terms of the ordinance adopted by popular vote on Jan. 19, and providing that the jitneys cease operation on April 1.

The jitney men claim in their petition that thirty-three days elapsed between the final adoption of the ordinance calling the election and the date when the election was held, and that constitutes a violation of the charter provision governing such elections.

Another contention is that the Mayor failed to post notices at some of the polling places thirty days in advance of the election; that the form of the ballot was confusing and misleading, and that the ordinance is void on the ground that in effect it grants a franchise to passenger carrying vehicles of more than fifteen passenger capacity.

The City Attorney has prepared another ordinance, which may be passed by the Council without submission to the people, and which will legislate the jitneys off all routes in the city. He has been working on this ordinance several days in anticipation of the injunction suit.

In case the city is restrained from enforcing the ordinance of Jan. 19, the Council is expected to pass the one which is now being drawn up by the City Attorney.

The ordinance of Jan. 19, under which the settlement was arranged, was passed by a vote of two to one.

Small Chance for Transit Legislation in New York

Three bills introduced by Senator Walker, which give to New York City "home rule" powers in the regulation of public utilities, including transit, as well as the right to own and operate transit lines and other public utilities, and three bills introduced by Senator Twomey vesting similar powers in all cities throughout the state were passed by the New York Senate on March 26. The bills were passed by a party vote of 26 to 24 and with no attempt by the Democrats to defend the measures when they were attacked by the Republicans.

Included in the number was a bill that would give to New York City the right to own and operate buses and trackless trolley lines.

A bill reorganizing the Public Service Commission abolishes the present commission of five members, removable only by the Legislature, and substitutes a commission of three subject to removal by the Governor. To this body would be transferred all the present powers of the Transit Commission not taken over by the New York City authorities under the Smith-Hylan transit legislation.

Indications are that the Legislature will remain deadlocked over the legislation, for the Assembly has still to speak. The differences between the two parties over what is best to be done has thus been explained:

> The only difference between the two party positions is this: The Republican Party says that ultimately the transportation facilities in the city of New York shall be self-sustaining. This is contemplated by the Republican measure in the Assembly.
>
> The Democratic Party says: Charge whatever deficit may result from municipal operation back on the taxpayers of the city.
>
> The Republican Party takes the position that ultimately in the aggregate, the transportation roads in New York must be self-supporting. It may take three, four or five years, but we insist that the service on the whole must be self-supporting.
>
> The only question is: Which principle shall we adopt? Are you going to make transportation pay for itself or charge it on the taxpayers? We are willing to stand on that issue. The only class of persons which should have the assistance of public funds are those known as the indigent class. Patrons of New York's transportation facilities cannot be classed as indigent persons. There is a question of principle at stake.
>
> If the Democrats are sincere they will accept the principle that the ultimate service should be self-sustaining. They know if they would accept this principle that they would get their legislation from this Legislature, but they would lose their political issue.

Sane Comment on Safety

R. E. Luellen, safety engineer, editor of *Safety*, a magazine devoted to the interests of the Union Traction Company of Indiana and its employees, commented in the issue of that paper for February on the fatal collision at Alfont on Feb. 2. Under the title "Let Us Be Undismayed" he said:

Increase in Free Rides a Menace

Commissioner Paul H. Maloney of the Department of Public Utilities has discovered that the number of free rides by the New Orleans Public Service, Inc., had grown to 1,673,271 during the year ended Jan. 31, 1924, representing a possible revenue of $117,129. The free rides were taken by the heads of the city department and their clerks and stenographers, uniformed policemen, firemen and members of religious orders.

In January, 1924, the number of free rides was 5,000 a day, an increase of 5 per cent over the average for January, 1923. Commissioner Maloney regards every free ride as a tax upon those who pay their fares. It is his intention to learn the sources of request for passes for men and women in the employ of the city.

The indeterminate permit under which the New Orleans Public Service, Inc., is operating in New Orleans provides that only uniformed policemen and firemen shall ride free.

> **OUT of a clear sky has come a bolt which shattered our wonderfully fine record of having carried 76,349,109 passengers without fatality occurring to a single one through the sole fault of the employees of this company. In four years seven months and twenty days we carried that number of people and during that time we operated our cars over a total of 37,761,041 miles. Our cars crossed railroad tracks at grade 12,950,630 times, and trains safely met and passed at sidings in single track interurban operation 1,450,053 times.**
>
> **It was a splendid record, the best our company had ever attained. . . . It meant so much to us! It gave us a greater pride in our company and in ourselves. It stimulated us to greater carefulness, greater effort. It gave us something to work for. It permitted us to feel that our company and we were making progress of a definite sort. We could go to our work or take passage on our cars with a feeling of security and safety.**
>
> **Then, as unexpectedly as a flash of lightning from a clear, blue sky, came the smiting, blighting bolt, at first stunning and benumbing our senses, then almost crushing us to earth with the weight of work and care it brought.**
>
> **The wonderful record has been broken, but the cause of SAFETY, the worth of SAFETY WORK, has not failed.**
>
> **Let us turn our faces to the sun. There has not been the storm of public criticism and denunciation which there would have been if we had not done the tremendous amount of safety work which we have done and have in various ways let the public know we have done and what we accomplished. The attitude of the thinking, fair-minded public, I am sure, is typified by what one representative business man said to me recently. He took occasion to stop me on the street and said to me, "I know you fellows have been hit an awful blow. You certainly have my heartfelt sympathy. Perhaps you feel now that your safety work has resulted in failure, but I want to tell you that I don't feel that way and I don't believe fair-minded people do. GO RIGHT AT IT AGAIN AND DO IT BETTER THAN EVER!"**
>
> **There's the keynote. Let's go right at it again and DO IT BETTER THAN EVER! Let us remember that more than 99 per cent of us HAVE NOT FAILED. Let us set ourselves resolutely, grimly, if need be, to the task of building up from the ruins of the old record a NEW, BIGGER and BETTER record. In this new structure the bricks will be our ACTS; they will be put in place by SUPERVISION, and the mortar to cement them into the strong, rugged structure of SAFETY must be the RULES. It cannot be otherwise.**
>
> **Building this new structure is your job and my job and the job of every Union Traction employee. Let us do it well, never forgetting for an instant the lesson this failure has taught.**
>
> **The CAUSE of SAFETY, the WORTH of SAFETY WORK, has not failed!**

Grade Crossing Legislation Likely in New York

Legislation has been prepared to carry out the provisions of the recommendations of Governor Smith for grade crossing elimination in New York State. One bill amends the railroad law by transferring all of the powers now vested in the Public Service Commission with respect to control over crossings to the Superintendent of Public Works, the Highway Department retaining, of course, the jurisdiction it now has in such matters. It is the opinion of the administration that the passage of this bill will facilitate greatly the issuance of a final order for crossing elimination as the request for the elimination and the action on it would be taken by the same department of state government. The general provisions of hearing and determination remain about the same in the amended law as now prevail.

Another provision of the bill does away with alteration of existing grade crossings and provides, in effect, that whenever any such crossings are altered they shall be converted into overhead or underground crossings. The present provisions of law is retained requiring expenses incurred by railroad corporations in any one year shall be as equitably distributed as practicable throughout the state so that one railroad will not be called to make a much larger expenditure than another railroad system for crossing elimination.

The constitutional amendment would pledge the credit of the state for the state's share of the elimination program to the extent of $100,000,000.

The Republican leaders are for the constitutional amendment lending the state's credit to the project, but are opposed to the transfer of jurisdiction.

Red Egg Symbol Shows Real Originality

The doctrine of association of ideas is not new in advertising, but clever applications of it deserve mention. To J. S. Bleecker, when he was general manager of the Columbus, Newark & Zanesville and the Indiana, Columbus & Eastern Railways, occurred the thought that if there was merit in associating a cigarette with the comparatively infrequent camel, why not try to associate the electric railway with the popular and ubiquitous egg? To make the egg symbol still more representative of vitality, it was decided to color it a vivid red. Thus came the slogan of the "Red Egg Lines." The egg is found not only on the company's rolling stock in red, but also nestles within the "S" and the "E" that form part of the good-will periodical entitled "Safety and Service."

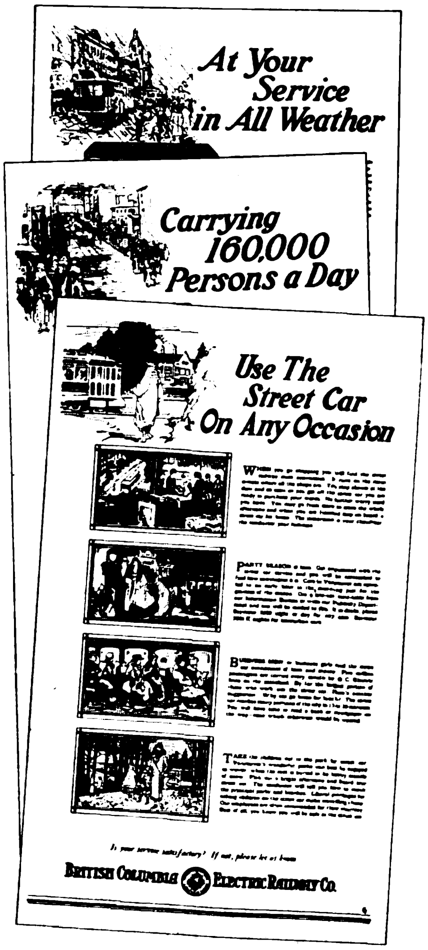
The adoption of this original symbol gave Mr. Bleecker the opportunity for a prize contest on "Why Is Our Transportation Service Like an Egg?" Most of the replies were serious or witty, with little evidence of the flippancy that an egg evokes among some persons. One customer wrote: "Because both imply careful transportation"; a second, "Because no adequate substitute has ever been found for either"; a third, "Because both were laid for the benefit of mankind" (second prize); a fourth, "Something to crow about" (third prize). The first prize was won by a patron who compared the railway and the egg as embodiments of the principle of life.

The prizes were $50 for the first, $35 for the second and $15 for the third. The winning answers were published in Vol. 1, No. 4 of "Safety & Service."

Mr. Bleecker, who has also done notable work in Ohio to set forth fairly the position of rail and bus, is still connected with the railways named through the management organization of Day & Zimmermann, Inc., Philadelphia. Some facts on the activities of the "Red Egg Lines" were given in the ELECTRIC RAILWAY JOURNAL, issue of March 15.

British Columbia Property Tells the World

A series of advertisements has been appearing in all the Vancouver, B. C., papers telling the story of the gas, light and power and railway service supplied by the British Columbia Electric Railway Company, Ltd. The "ads" were set up at a job plant and furnished to the newspapers in the form of electros. Besides giving some general information on its daily carrying capacity on the electric railway the posters enumerate the many advantages gained by riding on the electric cars. They have a message for the shopping fiend, the social belle, the matinee addict and the anxious churchgoer. The patrons of the British Columbia Electric Railway are told that on any occasion and in any weather the street car will furnish dependable service. In each "ad" the company asks the customer the question, "Is your service satisfactory? If not, please let us know."


At Your Service in All Weather
Carrying 160,000 Persons a Day
Use The Street Car On Any Occasion
British Columbia Electric Railway Co.

Posters Typical of the British Columbia Campaign

Traffic Improvement Plans Now in Effect in Grand Rapids

Recommendations with regard to speeding up traffic on the downtown streets of Grand Rapids, Mich., have been made by Gerald J. Wagner, consulting electrical engineer for the city. After repeated conferences on the subject of how to cope with the rush hour traffic, it was decided in every way possible to keep the motorist from Monroe Avenue along which practically every street car line in the city passes. In addition loading platforms are being installed in the downtown section which will enable two cars to load at once and men are placed at certain loading platforms from whom passengers can purchase tickets before boarding cars. Policemen at intersections, though governed by the signal lights, are to be permitted greater latitude in handling traffic tangles on their corners.

Peculiar Angle Given to Accident Case in Los Angeles

Before the Superior Court in Los Angeles is the question of the possible necessity for an amendment to one of the State laws of California, passed in 1872, which controls the carrying of passengers by a public conveyance corporation. The matter arose at a trial of a suit by a woman against one of the traction lines in Los Angeles for damages alleged to have been suffered on a crowded car.

The question is whether a railway can be held liable for damages by permitting more passengers to enter a car than can be accommodated with seats.

Attorneys are reported to see ahead a possible need for traction lines to reorganize their entire system, provided the court's decision favors the plaintiff. The plaintiff claimed she was a passenger on a crowded car in 1923 and suffered serious injuries when the car lurched suddenly and threw her against a rear section. She alleges the company was negligent in permitting the car to become overcrowded and with not properly providing passengers with seats.

The company asserts that if the plaintiff boarded an overcrowded car she did so voluntarily and, therefore, assumed the risk of injury with her own knowledge. Probably the injury was to be anticipated, the defendant contended, at the time the plaintiff boarded the car.

The two sections of the Civil Code of California affecting the control of street car traffic, and the status on which is involved the suit, follows:

> A common carrier of persons must provide every passenger with a seat. He must not overload his carrier by receiving or carrying more passengers than its rated capacity allows.
>
> A common carrier of persons must provide a sufficient number of vehicles to accommodate all passengers who can be reasonably expected to require carriage at any one time.

Application to Make Improvements in St. Louis Denied

Applications of Receiver Rolla Wells of the United Railways, St. Louis, to build 100 center-exit cars, known as Type 700, and to double track the Missouri Electric Railway's main line from St. John's station to the Woodson Road, St. Louis County, was denied by Federal Judge Faris on March 20. Judge Faris acted on the recommendation of acting Special Commissioner Fred L. Williams, who held that the contemplated expenditures would be in the nature of permanent improvements and should not be paid for out of the earnings of the company while it is in receivership. Holders of the bonds of the St. Louis & Suburban System opposed the improvements. The cars would have cost $1,050,000 and the double tracks $15,000 for the Wellston-St. Charles line, a distance of three-fifths of a mile.

Thomas E. Francis, attorney for Receiver Wells, argued that the proposed cars were in the nature of repairs, as they were intended to replace cars now in service, and that the new track on the St. Charles line was necessary to preserve that property's earning powers.

The United Railways shop at Thirty-ninth Street and Park Avenue is now working on the last fifty of 200 similar cars built since Receiver Wells took charge of the property, and it was intended to obtain permission for the construction of the additional cars in time to permit ordering of the necessary lumber, motors, etc., so that the shop forces could continue their present schedule of work.

Granted Bus Permit Between Los Angeles and Santa Monica

The California Railroad Commission on March 3, 1924, granted a permit to the Pacific Electric Railway to operate bus lines between Los Angeles and Santa Monica. It is stated that the railway proposes to have the line in operation in time to take care of the heavy summer travel to the beaches. Twenty-five passenger buses or larger will be used. The schedule of fares announced by the company to be put into effect was: One way, 38 cents; round trip, 60 cents, with a minimum charge of 6 cents for rides between fare breaks, or points in different zones. Special rates have been arranged for patrons desiring to purchase commutation books.

The Mayor of Santa Monica has made it plain that he will not vote for a franchise for any transportation line into the city which charges more than a 5-cent fare. The Pacific Electric local fare is now 6 cents.

During last December the California State Railroad Commission conducted a five-day hearing in Los Angeles in the matter of a bus line permit for the operation of motor bus service between Santa Monica Bay District and Los Angeles. The territory, a distance of 19 miles, at present is without motor bus service. Passengers between Los Angeles and Santa Monica are served by the Pacific Electric interurban lines, there being two separate interurban routes between the two cities. Three companies sought permit to render motor bus service, the Pacific Electric Railway, the Bay Cities Transit Company, which now serves the Santa Monica Bay District with a local bus system, and the United Stages, Inc. The Pacific Electric Railway also operates a system in Santa Monica.

Freight Station at Indianapolis Nearing Completion

Work is progressing rapidly on the interurban electric railway freight station on Kentucky Avenue, Indianapolis. The buildings are near completion and the tracks are being laid. It is possible that the companies may be able to use part of the station and new tracks before May 1. When this station is completed it will probably be the largest station of its kind in the world. It will be occupied jointly by the Interstate Public Company, the Union Traction Company, the Indianapolis & Cincinnati Traction Company and the Terre Haute, Indianapolis & Eastern Traction Company.

North Shore Line Announces Summer Bus Tours

Extensive motor tours into the vacation lands of Wisconsin are to be undertaken by the Chicago, North Shore & Milwaukee Railroad this season. Four tours of seven, four, three, and one day duration each are planned. The territory into which these tours will run includes some of the most beautiful spots in the Middle West.

Last season the North Shore Line operated motor coaches between Chicago, Ill., and Lake Geneva, Wis., with success and the extension of this service is a result of last year's experience. The Lake Geneva tour will be made this year.

On the seven-day tour coaches will leave Chicago Monday morning and reach Green Bay Thursday evening. The return to Chicago will be made by Sunday night. This round trip will be 959 miles. The cost of the tour will be $89, including hotel, meals and boat trip. Two other routes will cover practically the same territory with shorter side trips. They will be of five and three-day duration respectively. A regular one-day trip from Chicago to Lake Geneva and return, including a boat trip on Lake Geneva, will correspond with the trip conducted a year ago. The longer trips are to be made once a week, the coaches leaving Chicago every Monday, from June 16 to Sept. 22, inclusive.

A four-color folder is being prepared as part of the tour advertising program. In it the attractions of the territory will be outlined. This folder is to be illustrated with attractive scenes of the territory visited. It will also contain prices and other details of interest to the prospective traveler. The tour prices include lodgings and all meals, a feature which it is expected will appeal to the public as it will relieve the tourists of much of the detail usually encountered on vacations.

As in the past, the North Shore Line will continue its operation of motor coaches for special charter parties.

Jitney Injunction in New Jersey Creates Precedent

Vice-Chancellor Backes of New Jersey has granted to the Board of Public Utility Commissioners an injunction restraining Frederick D. and Louis Sheldon from operating a bus line through Dover and Wharton, alleging defiance of the board's order to cease. This is the first time that the commission has resorted to injunction to compel compliance with its orders. The decision by the vice-chancellor is regarded as establishing a precedent.

Counsel for the bus operators held that the order of the utilities board to cease operation, amounted to confiscation of property rights. The board had revoked its approval of the license granted the Sheldons because of violations of conditions imposed.

After reviewing the facts in the case and calling attention to the recent law by the Legislature imposing certain penalties for disregard of the utility commission's orders, the opinion by the vice-chancellor states:

> The jurisdiction of equity to protect the rights of the State is one of common exercise, usually upon the relation of the Attorney-General. But where, as here, the duty of protecting the public interest as against the unlawful operation of public utility jitneys is vested by the State in the board, the authority to vindicate the public right is conferred by necessary implication, if not by express terms, and the functions of the Attorney-General are bestowed. Proceedings at law by certiorari or madamus are obviously inappropriate. The board's action may be reviewed by certiorari or mandamus issues only to enforce legal rights, not to restrain unlawful acts.

Bus Plan for Aberdeen Abandoned

The City Council of Aberdeen, Wash., has abandoned its plan to grant a permit to a proposed stage line operator to compete with the Grays Harbor Railway & Light Company on its South Aberdeen Cosmopolis line. The decision followed the securing of promises from the railway to pave permanently the space between its tracks at different points; to double-track its line for a distance of 2,700 ft., and to place sufficient cars on the route to provide fifteen-minute service or better. A. E. Bertrand, manager of the company, assured the Council that important improvements to the company's traction system would be made during the present year.

The Mayor of Cosmopolis and other city officials had appeared before the Aberdeen City Council and registered complaints against the railway service, declaring that competition was necessary in the district. Business men from South Aberdeen joined in the appeal for better service and urged the granting of a permit to the bus operators, who had applied for a permit to operate between Cosmopolis and Aberdeen. Following the bus men's application the City Council of Aberdeen, had instructed City Attorney A. E. Cross to prepare a measure repealing a portion of the ordinance which granted to the Grays Harbor Railway & Light Company exclusive operating rights over streets on which tracks of the company are laid between F Street and the limits of the city at the Cosmopolis line.

News Notes

Public Hearing on Fare Petition.—The Maine Public Utilities Commission on April 1 will hold a public hearing on the petition of the Androscoggin & Kennebec Railway, which asked for an approval of an increase in its single fare from 9 to 10 cents. A schedule increasing the fares on the Androscoggin & Kennebec Railway from 7 to 9 cents, became effective Sept. 1, 1920.

Rates Reduced.—A change in mileage book rate on the Salt Lake & Utah Railroad, Salt Lake City, Utah, which will reduce the cost of the 1,000-mile book from $25 to $22.50, will become effective April 7. The mileage scrip will be honored by the Salt Lake & Utah Railroad, Bamberger Electric and Utah-Idaho Central Railroads.

Will Hold Election on Car Purchase.—An election is scheduled for May 20 in St. Petersburg, Fla., calling for a bond issue of $135,000 for the purchase of fifteen cars to be operated by the Municipal Railway of St. Petersburg.

Will Acquire Bus Line.—The Compton Transportation Company has applied to the California Railroad Commission for permission to sell its bus rights, properties and equipment used in the operation of the Long Beach-Huntington Park line to the Pacific Electric Railway. The application states that $43,707 will cover the sale. The sale does not include the Long Beach-Venice line.

Wage Hearings Started. — Hearings in the arbitration between the Worcester Consolidated and the Springfield Street Railways and the union were begun March 24. The first witness heard was Arthur Sturgis, Washington, D. C., who presented budgets pertaining to the cost of living, intended to support the petition of the men for a wage increase from 58 to 80 cents an hour.

Law Would Forbid Sale of Transfer.—A bill has been introduced in the General Assembly of Maryland passage of which would make it a misdemeanor for any person to sell or give away a transfer or for any person to use a transfer issued to any other person. The measure provides a fine of not less than $10 for the first offense and a fine of not less than $100 or six months imprisonment, or both, for the second or subsequent offenses.

Establishes Truck Line.—The Fitchburg & Leominster Street Railway has established a motor truck line between Winchendon and Fitchburg, Mass., accommodating freight patrons of the road in Winchendon, Westminster and Gardner and replacing the old electric express formerly operated by the Northern Massachusetts Street Railway.

Electric Railway Man Will Arrange Transport.—E. W. Ford, vice-president of the Memphis Street Railway, Memphis, Tenn., has accepted the chairmanship of the transportation committee of the Confederate reunion to be held in Memphis June 4, 5 and 6. He will arrange all schedules and rates, organize the transport resources of the city and hold them in readiness for emergencies. Arrangements will also be made to handle record automobile traffic.

Measure Fixing Size of Crew Defeated.—The bill before the Kentucky House for two-man cars in Louisville was defeated on March 11, forty to thirty-six.

Course Helpful to Many.—At the University of Colorado, Boulder, Prof. C. M. McCormick, with the use of moving picture slides, will endeavor to make clear many points connected with the short course for electric railway motormen. This is the second year the university has given this course, and while it is intended principally to school the men who handle cars, there is much about it that any one interested in elementary electrical engineering will find helpful.

Office to Be Moved. — The general offices of the Columbus, Newark & Zanesville Electric Railway will be moved from Springfield to Zanesville on April 1.

Lost Tickets Subject for Argument.—The Montreal Tramways, Montreal, Que., has objected to a decision of the Tramways Commission ordering it to establish a reserve fund of $500,000 to provide for the item of unredeemed tickets. An appeal has been entered with the Quebec Public Service Commission stating that this item should continue to be dealt with as at present, and shown as a liability in the annual statement. In the last annual report of the company the item of unredeemed tickets is shown as a liability amounting to $519,346. The matter will be discussed during the sitting of the Quebec Public Service Commission to be held in Montreal some time during the month of April.

Another Bus Service Started.—The Seattle Municipal Railway, Seattle, Wash., will operate a bus service on Beach Drive, between Orleans Street and West Dawson Street, connecting with the railway line at Orleans Street. West Seattle residents donated half the $6,500 cost of putting the bus in operation.

Voters Approve Rehabilitation.—The Canadian National Railway franchise for the rehabilitation of local and interurban electric lines at Niagara Falls, Ont., was approved by the voters of the city at a special franchise election March 19. Work on the new system will be started at once. An initial 7-cent fare will be charged and all future fare adjustments will be on the service-at-cost basis.

Jury Disagrees on Platform Employee's Theft.—The jury in Niagara County Court at Lockport, N. Y., disagreed in the case of Francis Reilley of Buffalo, former striking platform employee of the International Railway, Buffalo, on trial for alleged participation in the theft of dynamite. The theft occurred three days before the dynamite outrage on the Buffalo-Niagara Falls high-speed interurban line of the International at Ellwood Station during the strike. Reilley is the first of eleven men under indictment in the state courts for alleged participation in the theft and hauling of the dynamite from the town of Lockport to Buffalo.

Named National Councillor.—H. F. Dicke, general manager of the Utah Light & Traction Company, Salt Lake City, Utah, and vice-president of the Salt Lake City Chamber of Commerce, has been named national councillor of the organization to attend the twelfth annual meeting of the National Chamber of Commerce at Cleveland, Ohio, from May 5 to 12.

Rerouting Plan in Abeyance.—At the first reading of the plan submitted by Commissioner W. E. Cann for rerouting the lines of the Community Traction Company, Toledo, the City Council indicated that it was at present unwilling to finance improvements by increasing the capital value of the company as provided in the Milner Ordinance. It is anticipated that it will be several weeks before the plan will go through if it is adopted as a whole or in parts.

Will Start Bus Operation.—The Connecticut Company will install at once bus service on the Compo Beach line in Westport, Conn.

No Action by Council.—It is not decided whether the City Council of Everett, Wash., will protest the proposed elimination of the transfer privilege on the bus system of the Puget Sound International Power & Railway Company, as proposed in a new tariff. The railway operates the bus system in place of its former traction lines. It proposes the elimination for ninety days, claiming that it is unable to furnish this privilege for the 5-cent fare charged. All but one line is involved in the proposed change. The busmen's wages have been increased. After a week's hearing in the wage controversy between the company and the busmen's union, the arbitration board has granted a wage increase of 5 cents to 7 cents to busmen, according to time of service. The award is retroactive to Feb. 1. The increase asked by the busmen was 19 per cent. The company offered the men 3 per cent more. Busmen will now receive 55 to 61 cents an hour, instead of 48 to 56 cents.

Will Pay with Check.—The Market Street Railway, San Francisco, Cal., has adopted the plan of paying its employees by check instead of cash.

Boulevard Stop System Effective in April. — The City Council of Los Angeles, Cal., enacted an ordinance on March 13, effective April 13, applying the boulevard stop system to some streets devoted to street car lines. The boulevard stop system was tested on two main thoroughfares for several months, but protected only automobile traffic. The ordinance requires that all vehicles crossing certain streets must stop before passing the line of intersection. In the summary of Los Angeles traffic conditions made by George Baker Anderson, manager of transportation of the Los Angeles Railway, at the Midyear Meeting of the American Electric Railway Association and published in the ELECTRIC RAILWAY JOURNAL of March 8, page 372, mention was made of the boulevard stop plan then being of benefit only to traffic of largely non-necessity type.

Foreign News

Through Service in London

Through electric trains will be running between Hendon, Middlesex, and Moorgate Street in the city of London, England, by the middle of April. This is made possible by the completion of the connecting line between the Charing Cross and Hampstead Railway and the City & South London Railway, the connecting line being from Euston to Camden Town, and the opening of the reconstructed northern section of the City & South London line from Euston to Moorgate. Reductions in time of trips between various points will be from 5 minutes to a half hour.

In the rejuvenation of the City & South London Railway, the whole of the tunnels between Euston and Moorgate have now been enlarged to the standard diameter of the other tube lines. All the platforms have been lengthened to accommodate the longer trains. The Angel Station has been practically rebuilt and high speed lifts are being installed, while Moorgate is to have a larger station equipped with escalators and having a capacity of 10,000 passengers an hour.

Java Electrification Progresses

According to United States *Commerce Reports* rapid progress is being made by the railway authorities of Java with the electrification of the principal lines of that island. Completion of the work of constructing the power house at Tjibadak near the city of Solkaboemi, Java, and the transmission line from the power house to Batavia, a distance of 100 km., is expected to take place by June of the coming year. In addition to supplying power to the Batavia Loop Line the plant at Tjibadak, which will distribute at 70,000 volts, will also supply current for the city of Batavia and for Solkaboemi. The present plant of the Batavia Electric Light Company will be kept as a reserve station. It is said that the current will be very cheap, but the rates have not yet been made public, nor is it definitely known whether the electric light company will reduce its rates, which are rather high at present. The company has an exclusive franchise.

French Deficits to Be Lowered by Electrification

The French Minister of Public Works makes known the following figures as showing the deficits in railway operation in France during the last three years:

OPERATING DEFICITS OF FRENCH RAILWAY SYSTEMS, 1921-1923

Systems	1921 Francs	1922 Francs	1923 Francs
State	642,000,000	383,000,000	460,000,000
Alsace-Lorraine	78,000,000	82,000,000	50,000,000
Nord	247,000,000	119,000,000	188,000,000
Est	159,000,000	7,000,000	55,000,000
Paris, Lyons, Mediterranean	407,000,000	244,000,000	180,000,000
Paris-Orleans	369,000,000	237,000,000	215,000,000
Midi	186,000,000	156,000,000	140,000,000

Of these companies the Midi, the P.L.M. and the Paris-Orleans have the most extensive electrical projects under way, principally in the Alps and Pyrenees. Various short-line feeders are already in operation and others are about to be put into service. It is claimed that with lighter, shorter, more frequent trains on short lines and the general saving in coal resulting from the electrification schemes which will be in operation throughout in from three to five years these deficits will be completely annulled. Incidentally, the present week fares and freight have been raised on all French railways, 50 per cent for the former and 12½ per cent for the latter.

Receipts of Paris Lines

The Metropolitan subway section of the Paris Transports en Commun during the calendar year of 1923 had receipts of 160,786,133 francs, corresponding to the sale of first and second class and workmen's return tickets to the number of 468,845,616.

The Compagnie Générale Parisienne de Tramways, the street car section of the all-inclusive Transports en Commun of the Paris district, increased its profits in 1923 by 1,245,590 francs as compared with 1922, the total profit of 1923 being 4,370,222 francs. It is proposed to use this entire profit for retiring priority shares, after first raising dividends 1 franc per share. Priority shares thus earn 16 francs and ordinary shares 13.50 francs. It may be mentioned that this profit really comes from the sale of property, rather than from operating.

Progress in Austrian Electrification

The electrification costs of the Austrian Railways from the middle of 1919 up to the close of November, 1923, as announced by the Austrian Federal Railways was 375,000,000,000 crowns, of which 270,000,000,000 were expended on the Arlberg line, 80,000,000,000 on the Salzkammergut railways, and 25,000,000,000 on the Mallnitz and Stubach plants. The budget for 1923 allocated 223,000,000,000 crowns for railway electrification. This amount was recently increased to 300,000,000,000 crowns in order to carry on the building activities to advantage. The same amount is set aside in 1924.

The operation of the electrified Innsbruck-Landeck section of the Innsbruck-Telfs line was commenced in July, 1923, and a trial run was successfully made on the Telfs-Landeck section in December last. Operation on the Innsbruck-Bludenz line after completion of the Spullersee plant is scheduled to take place in 1925. The cost of the locomotives to be used on the Innsbruck-Bludenz line will have to be carried over to 1925. Upon completion of the contemplated building activities 270 km. of Austrian federal lines will be electrified by the commencement of 1925.

A partially electrified operation will result in a considerable economy of coal, as the saving for 1924 alone is estimated at 25,000,000,000 crowns or $360,000. Progress has been made in electrifying several stretches of the Austrian railway and some of the most difficult tasks were accomplished during the summer of 1923, according to recent commerce reports.

African Electrification in Prospect.—The Congo Railway will be rebuilt. The work has been started on two sections. Supplementing the original proposal, according to the *African World*, the line will now be electrified, using the trolley system. It is believed that four years will be required to change over the line, which is at present narrow gage and 400 km. long.

Railway Proposed in Spain.—A committee from one of the industrial centers of Spain recently waited on the government in Madrid to secure authorization for the construction of an electric railway between Corunna and Santiago, and at the same time to request the government to guarantee interest of 5 per cent on capital already invested. Construction will begin as soon as authorization is granted.

Nice Tramway Gains.—The Compagnie de Tramways de Nice, France, had receipts for the calendar year of 1923 of 12,689,636 francs, as compared with 11,231,110 francs in 1922. For at least seven months of the year this line caters to a vast tourist traffic, it being estimated that in the height of the season the normal population, some hundred and fifty thousand, more than doubles itself.

Another Tramway Into London.—The construction has been authorized of an extension to the tramway of the London County Council across Southwark Bridge with a northern terminus at Queen Street Place, within almost a stone-throw of the Bank of England and the Mansion House. The extension still must obtain the sanction of Parliament.

Electrification Planned for South Manchuria.—A project is being worked out to electrify the lines of the South Manchuria Railway, which operates a system of railroads between Fusan, Seoul, Mukden, Dairen and Changchun. The engineers have calculated that the fall in the Yalu River at a point 100 miles north of Antung is sufficient to develop 100,000 kw. of electrical power. It is likely that the section of the road between Mukden and Dairen, about 200 route-miles, will be the first to be electrified. The intention is also to supply power, light and heat from the hydraulic plant, using the surplus power in the development of agriculture.

Financial and Corporate

$12,815,416 Divided in Chicago

This Amount Split Between Two Companies Before Payment of One Made to City

Residue receipts of the Chicago Surface Lines for the year ended Jan. 31, 1924, were $12,815,416. This sum was divided on the basis of $7,689,249 to the Chicago Railways and $5,126,166 to the so-called South Side Lines. These amounts include, of course, the city's 55 per cent of the net divisible receipts as defined in the 1907 settlement ordinance.

As of Feb. 1, 1923, the total purchase price at which the city could recapture the properties was $160,944,225, while on Feb. 1, this year, that price stood at $162,161,129. During the seventeen years of the ordinance period the companies have increased their facilities for serving the public by capital expenditures of $106,386,000, or a yearly average of more than $6,250,000.

Comparisons of statistics of the Surface Lines system at the end of the first year of unified operation (Jan. 31, 1915) and at the close of the tenth year (Jan. 31, 1924) follow:

Item	1915	1924	Per Cent Increase
Gross earnings	$31,966,049	$57,655,170	80.36
Operating expenses	$19,889,276	$44,839,753	125.45
Total wages paid	$12,379,615	$29,744,012	140.27
Revenue passengers carried	627,731,550	824,850,103	31.40
Total rides	1,115,312,129	1,467,344,286	31.56
Average fare per revenue passenger	4.99c	6.91c	38.48
Average fare per ride	2.81c	3.88c	38.08
Trainmen in service	8,847	11,745	32.76

During the ten-year period of unified operation $52,017,331 has been paid out for public benefits. Since the 1907 ordinances a total of $85,752,727.08 has been paid out for similar purposes.

In June, 1920, revenue passengers on the system reached a new daily average high peak of 2,238,760. After that business fell off and this record was not reached until March of last year. It was again passed in April, May, June, October, December and January—the highest mark being October, with 2,327,181. The highest traffic day was Dec. 15, 1923, when 2,690,857 revenue passengers were hauled, total rides on that day being 4,688,158.

EARNINGS STATEMENT OF THE CHICAGO SURFACE LINES FOR TWELVE MONTHS ENDED JAN. 31

	1923	1924
Earnings:		
Passenger cars (including M. C.)	$55,495,310	$56,985,687
Chartered cars	9,594	7,942
Newspaper cars	15,868	13,618
Freight earnings	1,864	3,023
Hospital car service	5,078	5,870
Advertising	253,677	260,804
Rents of buildings, etc.	100,244	141,349
Sale of power	89,340	95,993
Interest on deposits	119,032	126,864
Miscellaneous	13,054	13,019
Gross earnings	$56,103,061	$57,655,169
Expenses:		
Way and structures	$2,556,627	$2,682,066
Equipment	3,788,170	3,858,865
Renewals	4,488,244	4,612,413
Power—maintenance	316,449	361,955
Power—operation	3,175,390	3,321,683
Conducting transportation—trainmen	19,662,636	19,640,721
Conducting transportation—other	2,912,780	3,030,585
Traffic	42,097	44,208
General and miscellaneous—damages	2,356,328	2,421,517
General and miscellaneous—other	1,859,348	1,695,740
Taxes	3,258,000	3,170,000
Total expenses	$44,416,069	$44,839,753
Residue receipts	*$11,686,992	*$12,815,416
Divided:		
Chicago Railways 60 per cent	*$7,012,195	*$7,689,249
South Side Lines—40 per cent	*4,674,797	*5,126,167

* Includes city's 55 per cent of net divisible receipts, as defined by ordinances.

In the combined system are included 1,063 miles of single track. The rolling stock equipment consists of 3,904 cars, of which 3,417 are passenger cars.

During the year 219 passenger cars were added to the equipment divided as follows:

169 double truck two-man cars (of which 69 were built at company shops);

43 double truck one-man cars (built at company shops);

7 trail cars (to replace an equal number destroyed in Devon Avenue car house fire).

The shops are now constructing twenty-three double truck two-man cars.

As an illustration of increased use of equipment the following figures for various years are of interest:

Year Ending	Av. Miles per Car
1-31-24	37,400
1-31-23	37,152
1-31-22	37,226
1-31-21	37,122
1-31-20	36,195
1-31-19	35,871

Henry A. Blair, president, in reviewing the affairs of the company, says that since the coming into office of Mayor Dever and a new Council of fifty members the fairest relations have prevailed between the new administration and the management of the companies and that the outlook is for a continued square deal. Public relations have also been improved during the year. Reference is also made to the wage arbitrations during the year and to the award to Amalgamated men of 3 cents an hour more during the year starting June 1, 1923, and an additional 2 cents an hour during the year which will begin on June 1, 1924. So far as the bus is concerned, Mr. Blair indicates that the principle appears to be pretty well established in Illinois at least that it would be contrary to public policy to authorize competing lines where the existing carriers are furnishing an essential service.

On June 1 the company established its own insurance department. After a thorough inspection of the various properties and a comparison of insurance rates and schedules, an average rate reduction in policies of nearly 50 per cent was made effective on the date of expiration, Oct. 4, for a period extending to Feb. 1, 1927. The actual saving in premium was at the rate of $94,685 a year, or $310,883 for the period. Savings were also effected in cost of burglary, holdup, automobile and

REVENUE PASSENGER STATISTICS OF CHICAGO SURFACE LINES

Year Ended	Weekday Average	Saturday Average	Sunday* Average	Total for Year
Jan. 31, 1924	2,354,139	2,521,487	1,623,414	824,850,103
Jan. 31, 1923	2,204,425	2,356,385	1,563,911	762,629,211
Jan. 31, 1922	2,129,217	2,251,293	1,560,310	750,515,622

* Includes holidays.
Trainmen's strike Aug. 1 to 6, 1922, inclusive.

STATISTICAL DATA OF CHICAGO SURFACE LINES FOR THE FISCAL YEARS ENDED JAN. 31

	1918	1919	1920*	1921†	1922	1923‡	1924
Rate of fare	5 Cents	5 Cents	5 Cents	6 Cents	8 Cents	8 Cents	7, 6 2/3 Cents
Revenue passengers	692,815,889	685,300,718	743,746,584	769,025,413	750,515,622	762,629,211	824,850,103
Passenger receipts	$34,566,601	$34,186,578	$43,417,639	$54,726,740	$59,706,412	$55,495,310	$56,986,687
Total earnings	35,114,633	34,710,097	43,963,438	55,327,384	60,343,733	56,103,061	57,655,169
Operating wages	12,854,406	14,768,088	19,854,173	28,204,341	29,676,981	27,163,996	27,458,736
Other operating expenses and taxes	10,247,289	10,963,848	13,399,841	15,096,050	16,839,168	17,252,072	17,381,016
Residue receipts	12,012,937	8,978,160	10,709,423	12,026,992	13,827,583	11,686,992	12,815,416
Less: Joint account expenses	648,205	478,831	181,862	164,733	449,000	620,000	885,000
	$11,364,731	$8,499,329	$10,527,561	$11,862,258	$13,378,583	$11,066,992	$11,930,416
5 per cent on purchase price	$7,661,542	$7,802,574	$7,893,292	$7,974,289	$8,024,104	$8,039,343	$8,076,569
55 per cent to city	$2,036,754	$383,216	$1,448,848	$2,138,383	$2,944,963	$1,665,207	$2,119,616
45 per cent to companies	$1,666,435	$313,539	$1,185,421	$1,749,586	$2,409,516	$1,362,442	$1,734,231

*5-cent fare in effect 2-1-1919 to 8-7-1919; 7-cent fare in effect 8-8-1919; to 11-30-1919; 7-cent, 6½-cent and 6-cent fare in effect 12-1-1919 to 12-26-1919; 6-cent fare in effect 17-27-1919 to 1-31-1920. †6-cent fare in effect 2-1-1920 to 6-30-1920; 8-cent fare in effect 7-1-1920 to 1-31-1921. ‡8-cent fare in effect 2-1-1922 to 6-14-1922; 7-cent fare and 6½-cent fare 6-15-1922 to 1-31-1923.

other forms of insurance. An inspection system was put in effect to maintain the highest standards in general housekeeping and fire prevention.

The balance in the reserve for renewals on Feb. 1, 1923, was $12,366,120. The similar balance on Feb. 1, 1924, was $13,141,525. The balance in the special reserve on Feb. 1, 1924, was $1,396,117, so that the total balance on Feb. 1, 1924, was $14,537,642. This balance is a cash balance and is on deposit in various banks.

Surplus of Hudson & Manhattan Larger

The report of the Hudson & Manhattan Railroad, operating under the Hudson River between New York and New Jersey, for the year ended Dec. 31, 1923, shows a surplus of $1,356,355, after taxes and bond interest including adjustment income bonds compared with $835,731 in the preceding year. After allowing for 5 per cent dividend requirements on the preferred stock the balance of surplus available is equivalent to $2.73 a share on the $39,994,890 of outstanding common stock, compared with $1.43 in 1922.

President Oren Root says that while the net return from railroad operations shows a satisfactory increase during 1923 it is still very much less than the 5.75 per cent determined by the Interstate Commerce Commission as a fair return upon the aggregate value of the railway property of carriers as defined in Section 15-A of the interstate commerce act.

The income account for 1923 compares as follows:

	1923	1922
Operating revenue	$8,228,522	$7,862,419
Expenses and taxes	4,634,287	4,494,372
Operating income	$3,594,235	$3,368,047
Other income	1,553,954	1,291,365
Non-operating income	279,245	264,154
Total income	$5,427,434	$4,923,557
*Bond interest, etc	$2,425,979	$2,432,726
Balance	$3,011,455	$2,490,831
Adjustment in bond interest	1,655,100	1,655,100
Surplus	$1,356,355	$835,731

* Exclusive of interest on adjustment income bonds.

Fewer Passengers Being Carried in Grand Rapids

A decrease of 954,819 passengers during 1923 on the Grand Rapids Railway is reported in an audit received by City Manager Locke from James B. Hogarth, Chicago. Every line carried fewer passengers in 1923 than in the previous year, totals for the two years being 23,103,961 and 24,058,780 respectively.

Gross receipts for 1923 were $1,818,318, and after deducting $1,119,114 for operating expenses, $135,543 for taxes and $171,696 for depreciation, a net income of $391,543 was reported.

The auditor investigating for the city determined that $457,857 was necessary to provide the 8 per cent which the city has agreed the company should receive. The report also showed that the deficit found by Mr. Hogarth corresponded with the company's own audit, which the city wished to check following a recent fare raise of from seven to six rides for 50 cents.

Mr. Hogarth said he believed that when the riding habit grows there should be a reflection at once in the affairs of the company of an ability to lower the present rate of fare.

Only in March and April was there an increase in the number of passengers over the previous year. Tickets were purchased by 83 per cent of the riders, while the rest paid the alternative straight 10-cent fare.

The valuation on which the company is permitted to earn a return increased during the year from $5,605,704 to $5,814,509.

Labor Troubles Affect Mexican Results

The net income of the Mexico Tramways for the year ended Dec. 31, 1922, was $2,097,918 in Mexican currency. In 1921 in Mexican currency the net earnings amounted to $2,335,436. This fact was disclosed in the ninth annual report recently submitted to the shareholders. The total expense from operation plus maintenance and taxes was $10,244,498 in 1922, compared with $10,139,854 in 1921. An allowance of $600,000 was made for depreciation in 1922. The total number of first and second-class passengers was 109,286,678 in 1922 and 110,708,925 in 1921.

In accordance with the program of the company developed in connection with the reorganization two half-yearly coupons on the first mortgage bonds of the company were paid during 1922. Interest still in arrears at the end of 1922 on the first mortgage bonds is $3,278,450, while the unpaid interest on the 6 per cent mortgage bonds is $3,627,443.

In an appendix G. R. G. Conway, managing director resident in Mexico, stressed the labor agitation which he said had a marked influence on the growth of the jitney competition. To meet this competition he said it would be necessary to rearrange a number of its existing routes and also to add very considerably to the rolling stock.

Rochester Reports Surplus for Quarter

Operations of the Rochester lines of the New York State Railways for the quarter ended Jan. 31 show a surplus of $25,118. So reports Commissioner of Railways Charles R. Barnes. The report covers the operations both of the street car and bus and trackless trolley lines in the city. The bus and trolley bus routes are operated by the Rochester Co-ordinated Bus Lines, Inc., a subsidiary of the New York State Railways.

The operation of buses, which began on Nov. 1, 1923, show a deficit of $2,836.

On the Dewey Avenue motor bus line 23,156 cash and 11,988 transfer passengers were carried during the quarter. The trackless trolleys carried 163,256 cash and 82,480 transfer passengers. In all 18,563 bus miles were run on the bus line and 42,513 on the crosstown trolley bus system.

The total revenues were: Dewey Avenue bus line: $4,467; trolley bus line, $10,134.

Advice of Court Sought on St. Louis Valuation

Definite court action toward accepting the Missouri Public Service Commission's valuation of $53,620,059 was taken by Counsellor Rolla Wells, receiver for the United Railways, St. Louis, on March 22. On that day an application was filed in the United States District Court asking the court for advice on the advisability of withdrawing a petition for a review of the state board's valuation.

Both Mr. Wells and the city of St. Louis had applied previously for a Circuit Court review of the commission's findings, but several days ago it was announced that the receiver and financial interests connected with the United Railways had decided to ask the court for instructions with respect to accepting the valuation in view of the desirability of lifting the receivership as promptly as possible and of avoiding litigation that probably would consume at least another two years.

A motion has also been filed in the Federal Court on looking toward a consolidation of the various foreclosure suits now pending against the company. This motion was submitted on March 24 without argument as counsel for the Suburban bondholders, who have been contending for a separate valuation of that part of the United Railways, cannot say what their attitude will be until the valuation matter has been finally disposed of.

Motions to dismiss the foreclosure suits also were submitted without argument. Federal Judge Faris several days ago overruled a similar motion. The dismissal motions raise the question of the court's jurisdiction. As the court has already held that it has jurisdiction the new motion will probably be overruled also.

P. R. T. Proposals Accepted at Meeting

The stockholders of the Philadelphia Rapid Transit Company, Philadelphia, Pa., at a recent meeting adopted several resolutions recommended by the management. One provided for the renewal of the present agreement between the company and T. E. Mitten, upon the same terms, but with Mitten Management, Inc., rather than with T. E. Mitten personally. Another resolution approved the payment of a co-operative wage dividend of not more than 10 per cent of the annual wage for 1924, to be paid employees after the payment of the regular 6 per cent dividend to the stockholders. A third resolution gave the consent of the stockholders to the proposed increase of the company's indebtedness from $15,000,000 to $25,000,000. Another approved a guarantee given by the company to an issue of $3,500,000 of first mortgage, 6 per cent real estate bonds of C. Benton Cooper, dated Jan. 1, 1924, undertaken in connection with the sale of these bonds. The final resolution gave consent to the company's becoming guarantor of notes, and other obligations that may be issued in connection with the development of the bus business of the Philadelphia Rural Transit Company.

$8,496 Increase in Duluth-Superior Net

The gross revenue of the Duluth-Superior Traction Company, Duluth, Minn., for the year 1923, after adjusting the passenger revenue to include receipts from the use of conditional redeemable coupon tickets, shows an increase of $121,589, or 6.71 per cent as compared with the figures in the report for the year 1922.

Operating expenses for 1923 show an increase of $95,622 over 1922. This increase is due to increased service and better upkeep of the equipment and track.

General taxes in the city of Duluth and the federal corporation income taxes increased $18,501 over the previous year.

CONDENSED INCOME STATEMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

	1923	1922
Operating revenue	$1,904,606	$1,784,774
Operating expenses ...	1,500,987	1,405,365
Net revenue	$403,618	$379,408
Taxes	134,991	116,489
Operating income ...	$268,627	$262,919
Total non-operating income	28,730	26,973
Gross income	$297,357	$289,892
Interest of funded debt, etc.	174,247	175,277
Net income transferred to profit and loss	$123,110	$114,615
General mortgage sinking fund payment...	25,284	20,614

STATISTICAL STATEMENT OF DULUTH-SUPERIOR TRACTION COMPANY

	1923	1922
Total revenue	$1,933,337	$1,811,747
Total operating expense including depreciation	$1,500,987	$1,405,365
Net revenue	$432,349	$406,381
Revenue passengers carried	31,343,815	32,036,900
Transfers redeemed ...	5,354,872	5,366,154
Operating, per cent of revenue, taxes included	84.62	84.00
Per cent on preferred stock, paid	6.00	5.00
Per cent on common stock, paid	1.00	.00

The net income for 1923 transferred to profit and loss shows an increase of $8,496 over the year 1922.

In accordance with the order of the Railroad Commission of Wisconsin the company began to collect a 10-cent cash fare and to sell tickets at the rate of five rides for 30 cents in Duluth on Oct. 1, 1923, but it was deemed too early for the purpose of the annual report to attempt to state with any degree of accuracy the effect of this rate upon the earnings.

Birmingham Sale Continued

The sale of the Birmingham Railway, Light & Power Company's property, Birmingham, Ala., which was advertised to have taken place on March 24, was continued until March 31 on the grounds that the receivers of the company thought best to make final settlements of some franchise extensions with the Birmingham city commissioners, and also some other agreements with the city. All of these matters are now straightened out, it is announced, and the sale will take place on the last day of March.

The sale of the Tidewater line, which is included in a separate company, but which is under the same control as the Birmingham Railway, Light & Power Company, was also advertised for sale. The sale of this line was likewise continued until March 31.

The bulk of the stock of the Birmingham Railway, Light & Power Company is owned by the National Power & Light Company, and this company is expected to bid on the purchase of the entire concern, it is announced.

The Tidewater line runs from East Lake to Ensley, a distance of about 15 miles. Much of the territory along the line is thinly settled, hence the traffic over this line is not heavy.

Extension of Maturity Date Proposed

Holders of the 6 per cent five-year first mortgage bonds of the Michigan Railroad, Jackson, Mich., due on May 1 this year, will probably receive an offer in the next few days for an extension of maturity date on the bonds in exchange for a bonus of between 20 and 25 per cent in preferred stock.

Earnings of the company, it was pointed out, while sufficient to meet all interest payments and provide a sinking fund, which has taken care of a large part of the bonds, were insufficient to make attractive to investors an issue of refunding bonds just at this time.

The bonds were issued on May 1, 1919. They are outstanding to the amount of $4,050,000, and are a first mortgage on approximately 159 miles of electric railroad from Grand Rapids to Kalamazoo to Battle Creek, and from Bay City, through Saginaw, to Flint.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were sold this week 100 shares of the Interborough Consolidated Corporation preferred, $2 a lot.

Bond Issue Authorized.—The Holyoke Street Railway, Holyoke, Mass., at its recent annual meeting authorized the issuance of $200,000 in bonds, maturing in 1935, to pay for improvements and equipment since 1915.

Trolleys Will Go.—Notices have been posted by the York Utilities Company, York Beach, Maine, which state that the railway between Kennebunk and York Beach will be discontinued after March 31. S. T. Dow, manager of the road, has also sent letters to this effect to the Selectmen of Kennebunk, Wells and York. This section of the York Utilities Company line has not been a paying proposition for a number of years.

Track Abandoned Permanently.—The Massachusetts North Eastern Railway has permanently abandoned the 14 miles of track from Nashua, N. H., to Pelham. The Nashua Street Railway, under a three months lease, will run cars to Hudson Center, and Pelham officials have been in consultation with the Nashua company endeavoring to have it extend operations through Pelham. The New Hampshire Public Service Commission has given the Nashua company six months to buy the roadbed at $3,000 a mile. If this offer is not accepted the road will be torn up.

Prior Preferred Stock Offered.—The National City Company, New York, is offering at 98 and accrued dividend yielding more than 7½ per cent $500,000 of the 7 per cent accumulative prior preferred stock of the Portland Railway, Light & Power Company, Portland, Ore. The stock is known as Series A. The proceeds will reimburse the company for construction expenditures, including those in connection with its new hydro-electric station.

Reduction in Taxes Ordered.—In line with the decision recently rendered by Federal Judge John G. Sater, reduction of taxes of the Columbus, Delaware & Marion Electric Company, Columbus, Ohio, amounting to $180,000, was ordered by Judge G. M. Wright, Marion. Recently Judge Sater held that public utilities should not be forced to pay taxes proportionately greater than those assessed against real estate in the district in which they operate. The property value was accordingly cut from $3,106,120 to $2,851,828. The company owns and operates city railway service in Marion and Delaware.

Town Takes Over Road.—The 7-mile stretch of electric railway between Athol and Orange, Mass., was taken over by the town of Athol March 22 and operation under a municipal commission of three members was commenced March 24. The plan of selling twelve tokens for 50 cents will be maintained. Each token is good for one zone, but nothing less than two tokens are collected, however short the ride. The taking over of the road has been delayed several times. It was necessary, finally, to introduce a bill in the Legislature to allow the town to operate the road, as it lies partly in Orange.

Asks Rehearing on Dues.—The Denver Tramway, Denver, Col., has asked for a rehearing in the matter of dues on its franchise. The United States Circuit Court of Appeals had decided against the property, ordering the company to pay the city the sum of $205,000 in back dues. When the city started the suit the tramway owed it $60,000, the amount increasing $5,000 monthly. The company paid it until it went into the hands of a receiver. It has been trying to place franchise dues in the same class as any ordinary bill. The court has decided against this practice.

Operation Will Cease March 30.—D. P. Abercrombie, receiver for the Connecticut Valley Street Railway, Greenfield, Mass., says that the line from Greenfield to Northampton will cease operation on March 30. At the annual town meeting on March 17, voters of Greenfield authorized the selectmen to negotiate with the receiver for the purchase of the line from Greenfield to Turners Falls, co-operating to that end with the town of Montague.

Taxes Increased.—The Athens Railway & Electric Company, Athens, Ga., has paid to the city of Athens taxes amounting to $3,000 on its gross income for 1923. The tax was about $300 more than was paid in 1922.

Abandonment Recommended in Atlanta.—Recommendation that the railway on Jackson Street between Auburn and Forrest Avenues, on Mills and on Richardson Streets, Atlanta, Ga., be abandoned has just been made before the streets committee of the City Council by Preston S. Arkwright, president of the Georgia Railway & Power Company. This course was urged in a statement to the effect that the company is unable at present to meet the city assessments towards paving these streets. Mr. Arkwright said that paving assessments levied against the railway this year bid fair to reach a total of $360,000. He said that if the company paved Kelly Street, Edgewood Avenue, Richardson Street, South Boulevard, Copper Street, Jackson Street and Peachtree Road, outside the city, it would cost $360,000 and possibly more. Yet that was what the city wanted the company to do.

Repurchase Proposed.—The Montreal Tramways & Power Company, Montreal, Que., is said to intend to exercise its option for the repurchase of the Canadian Light & Power Company. The latter company is at present owned by the Montreal Public Service Corporation (now the Quebec & New England Hydro-Electric Corporation). It will be recalled that minority shareholders criticised the sale of these properties by the Tramway & Power Company during the controversy of a few months ago. It came out at that time that the Montreal Tramway & Power Company had sold the Canadian Light, Heat & Power Company to the Public Service Corporation in order that the company could pledge the common stock and bonds as security for a bond issue. A recapture clause was put in the agreement of sale and the Montreal Tramway & Power Company has until July 2 to repurchase the securities that were transferred and pledged. The directors, it is learned, have decided to exercise their option and thus bring the Canadian Light & Power Company, with its 20,000 hp. plant at St. Timothee, directly under their control.

$39,000 Surplus in Worcester.—Gross earnings of the Worcester Consolidated Street Railway, Worcester, Mass., for the year ended Dec. 31, 1923, increased $144,736. The company finished the year with a surplus of $39,000, approximately the same surplus as was reported a year ago. Operating expenses increased $155,659 over the previous year. Gross revenues for the year were $4.544,132, compared with $4,399,396 in 1922. The operating expenses for 1923 totaled $3,601,755, compared with $3,446,095 in 1922.

Partial Discontinuance Authorized.—The Pacific Electric Railway, Los Angeles, Cal., has been authorized by the Railroad Commission to suspend, until further order, operation of its passenger service on the Laurel Canyon line of its western division, between Gardner Junction and along Sunset Boulevard to the end of the line. Bus service paralleling the rail service is now being given on Sunset Boulevard by the Los Angeles Motor Bus Company, in which the railway is interested, and discontinuance of railway service has been requested by the Board of Public Utilities of Los Angeles.

Personal Items

T. H. Kendrigan Elected New England Club President

Thomas H. Kendrigan, superintendent of the Manchester Street Railway, was elected president of the New England Street Railway Club at its business session on March 27. Except for a short term of service in the textile industry Mr. Kendrigan's entire career has been spent in the railway business. He began street railway work as a motorman on the former Lowell, Lawrence & Haverhill Street Railway. This was in May, 1899. After two years on this property he took a similar position on the Manchester Street Railway, but at the end of one year he changed to the claim department. In 1912 he was appointed superintendent of the Manchester Street Railway, though still retaining the duties of claim agent. Both positions he has occupied ever since.

T. H. Kendrigan

Mr. Kendrigan was born in Ireland on Jan. 3, 1860. His parents removed to Manchester when Mr. Kendrigan was a child. He was educated in the public schools of that city. As was indicated previously, he was first employed in the textile industry in Manchester and later was employed in the Pacific mill at Lawrence, Mass., as a loom repairer from 1895 to 1899. He then began his railroad career. Mr. Kendrigan has always taken an active part in the work of the New England Street Railway Club. Last year he was vice-president of the club, representing New Hampshire.

Louis O. Hoff has succeeded Roy S. Preston as commissioner of public property in Pekin, Ill. He has charge of the Pekin Municipal Railway.

M. Williams is now treasurer of the Peoria Railway Terminal Company, Peoria, Ill., succeeding H. E. R. Wood.

E. J. Hinely has been appointed purchasing agent of the Savannah Electric & Power Company, Savannah, Ga., filling the vacancy caused by the death of F. M. Martzall. Mr. Hinely's appointment is a promotion. He had served in the storeroom as a stock clerk for a number of years.

A. C. Babson has been added as one of the vice-presidents of the Northern Indiana Power Company, Kokomo, Ind.

J. H. Seabright has succeeded B. R. Kuss as claim agent of the Gary & Valparaiso Railway, Gary, Ind.

V. H. Sayre has replaced R. N. Weaver as freight claim agent of the Ford Dodge, Des Moines & Southern Railroad, Boone, Iowa.

S. B. Severson, at one time president and general manager of the Manhattan & Queens Traction Corporation, New York, N. Y., has been appointed general manager of the natural gas subsidiaries of the Cities Service Company with headquarters in Buffalo.

F. H. Bird has succeeded Arsene Pujo as vice-president of the Lake Charles Railway, Light & Water Works Company, Lake Charles, La.

George Kelly has succeeeded C. W. DeForest as chief engineer of the Cincinnati, Newport & Covington Railway, Covington, Ky.

T. J. Clements has replaced E. A. Turpin as superintendent of transportation of the Miami Beach Electric Company, Miami, Fla.

F. W. Woodstock has succeeded Nicholas G. Roosevelt as vice-president of the Washington-Virginia Railway. Mr. Woodstock's headquarters are in Philadelphia.

V. A. Sisler has replaced R. W. Crowell as purchasing agent of the Washington Railway & Electric Company, Washington, D. C.

W. E. King, formerly engineer way and structures of the Washington & Old Dominion Railway, Washington, D. C., is now chief engineer.

John W. Stanley has succeeded Allen Blanchard as master mechanic of the Hartford & Springfield Street Railway, Warehouse Point, Conn.

C. P. Landry has succeeded E. D. Loper as master mechanic of the Columbus Electric & Power Company, Columbus, Ga.

Fred C. Morton is now general superintendent of the Savannah Electric & Power Company, Savannah, Ga.

T. B. Webber, formerly secretary of the Kankakee & Urbana Traction Company, Urbana, Ill., has taken on the duties of vice-president as well. In the latter capacity he succeeds U. G. Fowler, who also performed the duties of treasurer.

F. A. Jordan has succeeded J. P. Dick as purchasing agent of the Atlanta Northern Railway, Atlanta, Ga.

John T. Jackson of New Orleans has been appointed special master in chancery in the New Orleans Railway & Light Company case by Judge Rufus Foster of the United States Court for the Eastern District of Louisiana. Mr. Jackson is a member of the firm of D. B. H. Chaffe, who held this office up to the time of his death, a few weeks ago.

J. M. Pneuman, well known in the Mid-Western electric railway field, has entered the commercial field as manufacturer's agent for electric railway supplies and equipment, operating from Berea, Ohio, a suburb of Cleveland. He will handle the products of the Columbia Machine Works & Malleable Iron Company. Mr. Pneuman's experience with electric railways started in 1902 as motor and controller inspector with the Brooklyn Rapid Transit Company, on the elevated division in East New York when electric service supplanted the steam. Leaving in 1906, he went with the Westinghouse Electric & Manufacturing Company at East Pittsburgh as wireman on New York, New Haven & Hartford Railroad locomotives and from that time until 1912 served in different capacities at East Pittsburgh and Stamford, Conn., in the electrification of the New Haven road in the rolling stock department. He has also been identified with the Allen & Peck Corporation as master mechanic of the Annapolis Short Line, Maryland, and with the Buffalo, Lockport & Rochester Railway. A few years ago he started in the practice of consulting engineering, which he has followed up to the present time.

Obituary

F. M. Martzall, formerly purchasing agent of the Savannah Electric & Power Company, Savannah, Ga., died recently.

F. A. Blanchard, lubrication engineer, for the past five years with the Texas Company in the electric street railway division, died in the Elizabeth, N. J., General Hospital on March 13, following an operation. Mr. Blanchard was connected with the S. L. Moore Engineering Company at Elizabeth, N. J., for a number of years before he became connected with the Texas Company.

Transportation Then and Now in Louisville

The Louisville Railway, Louisville, Ky., over the past several days has given an exhibit of progress in the form of an old mule car used in 1880 and one of its new double-truck Kuhlman cars that has just been received. The car of 1880 cost $1,000. It was 18 ft. over all and weighed 4,500 lb. It had a seating capacity of twenty-four persons and was drawn by one or two mules. The 1924 car cost $13,000. It is 45 ft. 1¾ in. over all, weighs 39,000 lb., seats forty-six persons and has four 40-hp. motors.

So that the public could see and appreciate the progress made in car development, the company placed one of the new cars and the little old mule car on a siding track in the heart of the downtown district. The company had made a picture postcard containing a view of the two cars and called it "Forty-four Years of Street Railway Transportation." In small type printed on the card the public was asked to compare the type of car built in 1880 with the new car just purchased. Facts concerning the cost, weight and seating capacity of each car were also given.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

G. E. Enlarges Its Repair Shops

A recent review of the supply and repair parts required in connection with the great variety of apparatus manufactured by the General Electric Company has led to the establishment of a wider and more adequate group of service and repair shops.

In addition to the service and repair shops maintained at all General Electric factories, thoroughly equipped shops have been installed and are in operation at the following points: Atlanta, Chicago, Los Angeles, New York, Kansas City, Minneapolis, Oakland, Philadelphia, St. Louis and Seattle. The personnel and facilities of these shops prepares them for any form of service work on machines up to 500 hp. In some of the larger shops apparatus of any size can be handled.

These shops are also prepared to furnish competent men on short notice in case of accidents or for any emergency work. An enlarged system of distributing replacement and supply parts is also in effect.

Galvanizing Plant Being Built for Bates Company

The Bates Expanded Steel Truss Company, Chicago, manufacturer of Bates poles used in electric railway and light service, is building a new galvanizing plant with all equipment of the latest design at East Chicago, Ind. Heretofore, such work has been done for it by outside companies. By doing this work in its own plant the company hopes to speed up deliveries.

A complete handling scheme is expected to decrease production costs and materially improve the shipping service. Five overhead electric carriage cranes are part of the new equipment. The plant is expected to be in actual operation by June 1.

Wire Company to Move

Plans to move all the machinery of the Atlantic Insulated Wire & Cable Company from Stamford, Conn., to Rome, N. Y., have been announced. Transfer is to be made next summer. This addition will make the Rome Wire Company one of the largest manufacturers of rubber-insulated wires and cables in the country.

The Rome company purchased all the capital stock of the Atlantic company in 1922 and since that time the plant of the latter has been continued under its former management, manufacturing rubber-covered wire and cable. The recent death of Edward Sawyer, who had been president of the Atlantic Insulated Wire & Cable Company since its organization, led the officers of the Rome Wire Company to the conclusion that it would be desirable to consolidate the company's operations at Rome.

The land and buildings at Stamford were sold to the Atlas Powder Company on March 5 and under the terms of the sale the Rome Wire Company agrees to remove all machinery prior to Oct. 1. The Atlantic company has been operating with about 200 employees. It has been a large purchaser of copper wire, buying practically all of it from the Rome Wire Company.

Mack Reports Good Bus Business

Mack Trucks, Inc., which recently placed on the market a specially designed passenger-carrying bus, reports the development of this branch of its truck business has been so rapid that directors foresee the necessity for enlarging factories and increasing facilities to handle the amount of business expected in the future. Partly on this account stockholders are being asked to approve an increase in the number of shares of common stock from 320,000 to 500,000. It is not proposed to issue additional shares at present, but it will be possible to take care of expenditures on this account in the future from sale of the proposed authorized shares to stockholders pro rata. Thus a flexible means will be provided to permit the company to work out expansion policies, without depending on current earnings or depriving stockholders of the dividends warranted by current business conditions.

Industrial Lull Causes Decrease in Orders

Sales of the General Electric Company for the first quarter of 1924 are estimated at $66,000,000. This compares with $80,010,045 for the first quarter of 1923 and $74,452,442 for the last three months of 1923. Operations are now about 75 per cent of capacity, having been curtailed as a result of the decline in orders. The reduction in sales is attributed largely to a lull in industrial business.

Metal, Coal and Material Prices

Metals—New York	March 25, 1924
Copper, electrolytic, cents per lb.	13.60
Copper wire base, cents per lb.	16.375
Lead, cents per lb.	9.00
Zinc, cents per lb.	6.712
Tin, Straits, cents per lb.	52.25
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.675
Somerset mine run, Boston, net tons	2.30
Pittsburgh mine run, Pittsburgh, net tons	2.125
Franklin, Ill., screenings, Chicago, net tons	1.825
Central, Ill., screenings, Chicago, net tons	1.55
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.75
Weatherproof wire base, N.Y., cents per lb.	18.00
Cement, Chicago net prices, without bags	$2.20
Linseed oil (5-bbl. lots) N. Y., per gal.	$0.93
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal.	$1.03

Rolling Stock

Monongahela-West Penn Public Service Company, Fairmont, W. Va., has received two new interurban cars for use between Fairmont and Clarksburg. They will accommodate seventy-two passengers instead of fifty-six, as the present cars do, and are provided with side doors.

Wheeling Traction Company, Wheeling, W. Va., has decided on the details for the twenty-one new cars being built by the Cincinnati Car Company at Winton Place, Ohio. The specifications follow:

Date order was placed	Feb. 27, 1924
Date of delivery,	Starting June 15, five per week
Builder of car body,	Cincinnati Car Company
Type of car,	Pass. motor; one-man; two-man double-end
Seating capacity	44
Total weight	32,000 lb.
Bolster centers, length	21 ft. 6 in.
Length over all	42 ft. 6 in.
Truck wheelbase	5 ft. 6 in.
Width over all	8 ft. 6½ in.
Height, rail to trolley base	10 ft. 6 in.
Body	Semi-steel
Interior trim	Cherry
Headlining	Agasote
Roof	Arch
Air brakes	Westinghouse semi-automatic, dead-man latch; Safety Car Devices Co.
Armature bearings	Sleeve
Axles,	Standard Motor Truck Company, 4½ in.
Bumpers,	Channel iron; anti-climber; West Penn Railways
Car signal system	Faraday buzzer
Car trimmings	Oxidized bronze
Bearings,	Center and side roller; West Penn Railways
Conduits	Flexiduct
Control	Westinghouse K-35-KK
Curtain fixtures	Curtain Supply Company
Curtain material	Pantasote double-faced
Designation signs,	Hunter illuminated side and dash
Door-operating mechanism,	National Pneumatic
Fare boxes	Cleveland
Fenders	Consolidated Car Fender Company, Type H-B
Gears and pinions	Nuttall helical
Hand brakes	Cincinnati geared
Heater equipment	Consolidated; truss plank
Headlights,	Crouse-Hinds incandescent and 250W
Journal bearings,	Sleeve; 3¾ in. x 7 in., MCB
Journal boxes	MCB
Lightning arresters	Westinghouse condenser type
Motors,	Westinghouse 510-A; four per car, inside hung
Paint	Enamel
Sanders	Ohio Brass air operated
Sash fixtures,	National Lock Washer Company
Seats	Hale & Kilburn
Seating material	Rattan
Slack adjuster	Gould Type B
Step treads	Kass Safety Tread
Trolley retrievers	Ohio Brass Company
Trolley base	U. S. No. 13
Trucks,	Standard Motor Truck Company, pressed steel
Ventilators	Nichols Lintern Type A
Wheels	Rolled steel—26 in. diameter

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., has received from the Inter-State Car Company five new 40-ft. box cars.

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind., has received from the Inter-State Car Company six stock cars which were rebuilt.

Track and Line

Eastern Wisconsin Electric Company, Sheboygan, Wis., will repair, straighten and level its trackage to eliminate bumps now present on the lines.

Northern Ohio Traction & Light Company, Akron, Ohio, which recently purchased at public auction the properties and equipment of the Cleveland, Alliance & Mahoning Valley Railway, Ravenna, Ohio, has plans underway for the expenditure of $225,000 in improving lines and service of that line.

Louisville Railway, Louisville, Ky., expects to build a double-track loop and siding at Eastern Parkway and Brook Street, to handle the crowds at Parkway Field, the baseball park completed last year.

Indiana Service Corporation, Fort Wayne, Ind., has purchased a 20-acre tract of land just inside the city limits which is to be used as a location for an entirely new maintenance of way department. The tract will be connected to the city lines, two of the interurban lines and the Lake Erie & Western Railroad, thereby providing unlimited switching accommodations for the loading and unloading of cars and carrying materials to and from the yards. The improvements completed will cost more than $100,000.

Power Houses, Shops and Buildings

Escanaba Power & Traction Company, Escanaba, Mich., with the recently acquired Escanaba Paper Company, plans to construct and install new equipment at its hydro-electric plant at Groos, Mich. The improvements are estimated to cost $100,000.

Connecticut Company, New Haven, Conn., has authorized H. R. Stamm, New Haven, to prepare plans for a repair and service station for buses at Waterbury, Conn. The building will be one-story high, 43 ft. x 175 ft.

Milwaukee Northern Railway, Cedarburg, Wis., has completed plans for the erection of a new and combined interurban passenger, freight and express terminal in Sheboygan to cost approximately $75,000. The passenger station will occupy an area of 36x60 ft. and will be one story high. The express and freight depot will occupy an area of 40x100 ft. The improvement will involve the installation of considerable track and overhead equipment.

Trade Notes

Zenas W. Carter has joined the Erickson Company, New York, advertising agency. For the past two and a half years Mr. Carter has been engaged on the special bus promotion program for the White Company. This work has been described as "the promotion of an idea to develop the opportunity for sales." The complete co-ordination of the White Company's branches and salesmen on this promotion program aroused the interest of the entire electric railway industry in the operation of buses. Included in the special work on which Mr. Carter has been engaged previously was the development and management of the national program of promotion for the Material Handling Machinery Manufacturers' Association. He also originated and developed the publicity and sales plans of the Granite Paving Block Manufacturers' Association. During the war Mr. Carter was chairman of the war service committee on metal lath, stationed at Washington, D. C.

General Electric Company, Schenectady, N. Y., announces the establishment of the Richard H. Rice Memorial Scholarship in memory of the manager of the Lynn Works, who died suddenly at Bolton, Lake George, Feb. 10, 1922. The scholarship, a permanent one, is to be at Stevens Institute of Technology, where Mr. Rice was graduated and was a trustee. All sons of Lynn Works employees may compete.

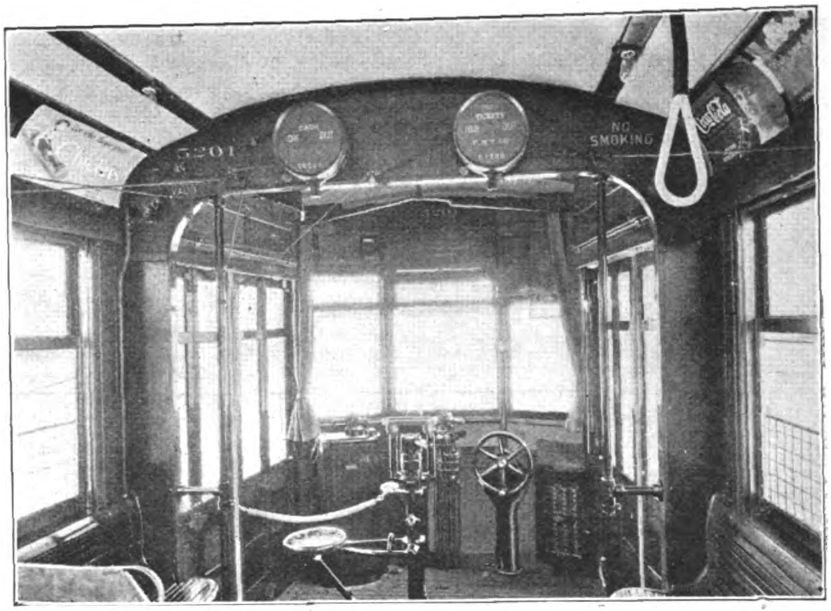
Portland Cement Association, Chicago, Ill., announces the appointment of C. D. Franks as assistant general manager in administrative charge of association work in the districts covered by the Minneapolis, Milwaukee, Des Moines, Chicago, St. Louis and Indianapolis offices. Until June 1, 1924, Mr. Franks' headquarters will be the Merchants Bank Building, Indianapolis. After that date his headquarters will be 111 West Washington Street, Chicago. L. C. Miller succeeds Mr. Franks as district engineer in charge of the Indianapolis office. The Indianapolis office of the association, located in the Merchants Bank Building, is in charge of the association work in Indiana and Kentucky. A new association office is open in Charlotte, N. C. John E. Tate, heretofore district engineer in charge of the New Orleans office, has been appointed district engineer in charge of it.

New Advertising Literature

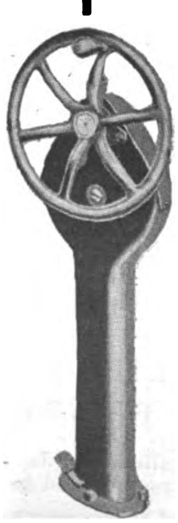
Crouse-Hinds Company, Syracuse, N. Y., has issued Bulletin No. 2053, an eight-page illustrated pamphlet, on "interlocking safety switch and plug."

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently published a fifty-six-page booklet entitled "High Voltage Porcelain Insulators — Their Design and Manufacture." This publication, which is known as S. P. 1690, has been issued for the purpose of presenting to engineers responsible for the design, installation and maintenance of high-voltage transmission systems information describing the design and manufacture of porcelain insulators. The booklet opens with a short chapter on the development of the art of pottery, which is followed by a description of the various manufacturing processes used in making porcelain. A succeeding chapter gives technical data on the experimental investigation of porcelain mixes. A study of the design of high-voltage insulators is next included, from the standpoint of electrical theory and from that of ceramics. This is followed by a chapter concerning the design of pin-type insulators, with photographs, sketches and drawings illustrating all the points included. A similar chapter on suspension insulator design and a brief description of the Westinghouse million-volt laboratory concludes the booklet.

Notice the hand-brake on this car!



PEACOCK STAFFLESS BRAKES



For double-truck safety cars

Especially suited to the modern one-man type of car—

Everybody knows that Peacock Staffless Brakes are practically a universal standard equipment for Birney safety cars. Especially desirable because the high live load ratio on these little cars demands a more powerful brake than the ordinary type.

Many of the orders recently received, however, are for the latest type, *double-truck* one-man type of car. The Peacock Staffless Brake has proved to be amply powerful to stop a loaded car of this type when emergency requires.

It occupies almost no space — the steel housing projecting but 3¼ inches from the dash into the vestibule. It is lightest in weight and has ample braking power and almost unlimited chain-winding capacity.

Order them for your new cars!

NATIONAL BRAKE COMPANY, Inc.
890 Ellicott Square
Buffalo, N. Y.

Canadian Representative: Lyman Tube & Supply Co., Montreal, Can.

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

The J. G. White
Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants,
Steam and Electric Railroads, Buildings and
Industrial Plants, Transmission Systems.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation
Management
52 Vanderbilt Ave., NEW YORK

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation,
Studies on Financial and Physical Rehabilitation
Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

J. ROWLAND BIBBINS
Engineer—927 Fifteenth St., WASHINGTON
TRANSPORTATION SURVEYS
Organized Traffic Relief and Transit Development
Co-ordinating Motor Transport, Railroad and City
Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINCKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND NEW YORK
1570 Hanna Bldg. 84 Pine St.

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

KELLY, COOKE & COMPANY
Engineers
149 BROADWAY 424 CHESTNUT STREET
NEW YORK PHILADELPHIA

EDWIN WORTHAM, E.E.

Consulting Engineer

Valuations of Electric Railways and Utilities of All Kinds

Traffic and Operating Studies

Allison Bldg. **Richmond, Va.**

Established Feb. 1913.

C. B. BUCHANAN President **W. H. PRICE, JR.** Sec'y-Treas. **JOHN F. LAYNG** Vice-President

BUCHANAN & LAYNG CORPORATION

Engineering and Management, Construction, Financial Reports, Traffic Surveys and Equipment Maintenance

BALTIMORE
825 Equitable Bldg.

Phone:
Hanover 2142

NEW YORK
49 Wall Street

JAMES E. ALLISON & CO.

Consulting Engineers

Specializing in Utility Rate Cases and Reports to Bankers and Investors

1017 Olive St., St. Louis, Mo.

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors **SYRACUSE, N. Y.**

HUMAN ENGINEERING

Railway Audit & Inspection Co., Inc.

Fourth and Chestnut Streets, Philadelphia

The Most Successful Men in the Electric Railway Industry read the

ELECTRIC RAILWAY JOURNAL

Every Week

THE P. EDWARD WISH SERVICE

50 Church St. ***Street Railway Inspection*** **131 State St.**

NEW YORK **DETECTIVES** **BOSTON**

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

Miraco
Belt Dressing
Rosin versus Reason

Rosin, and "surface" dressings containing rosin, are strongly adhesive when first applied and transmit every sudden power increase to the belt; but they disintegrate more or less rapidly, and as the coating becomes weak in spots the belt works under a series of straining impulses, frequently sufficient to completely destroy it, and always at a reduction of its ultimate life.

Miraco Belt Dressing is different! It does not lie on the surface, but penetrates and restores to leather the flexibility lost in tanning; the belt readily conforms to the pulley and transmission efficiency is thus increased through effective traction by simple friction alone. Miraco will positively increase the efficiency of any belt on which other compounds failed.

A BELT operating normally has a natural lag with reference to the driver pulley, and the driven pulley, in turn, lags behind the belt; and this lag increases momentarily with sudden loads. But there is a world of difference between this slight relative belt-to-pulley movement and "slippage." Lag *must* exist to save the belt; slippage must be *overcome* to conserve power.

MITCHELL-RAND MAKES MANY MIXTURES

Miraco Belt Dressing is not sticky, does not collect dust, never lumps; it does not lie on the surface, but impregnates the leather and makes it "plump" so that the belt "grips like the hand."

Try a 5-lb. pail—*at our expense if it does not improve your worst belt.* We have 2-oz. samples, too, that are sufficent for small belts, but we suggest the 5-lb. pail.

Jobbers find that "Miraco" invariably sells on demonstration. Additional distributors are wanted.

Handbook describing our complete line sent free.

Everything in Insulation

MITCHELL-RAND MFG. COMPANY

18 Vesey St., New York, N. Y.

In Repairing

Begin at

THAT is, with the track. Make the track right and the rolling stock will need very little repairs.

A street car is not a caterpillar tractor. Neither is it a tank.

It is designed and built to run on a resilient, easy-riding, noiseless track—if you want to get your money's worth out of it.

The only kind of track that is permanently this way is the Dayton Resilient Track.

There is a world of proof ready for you—if you will have it!

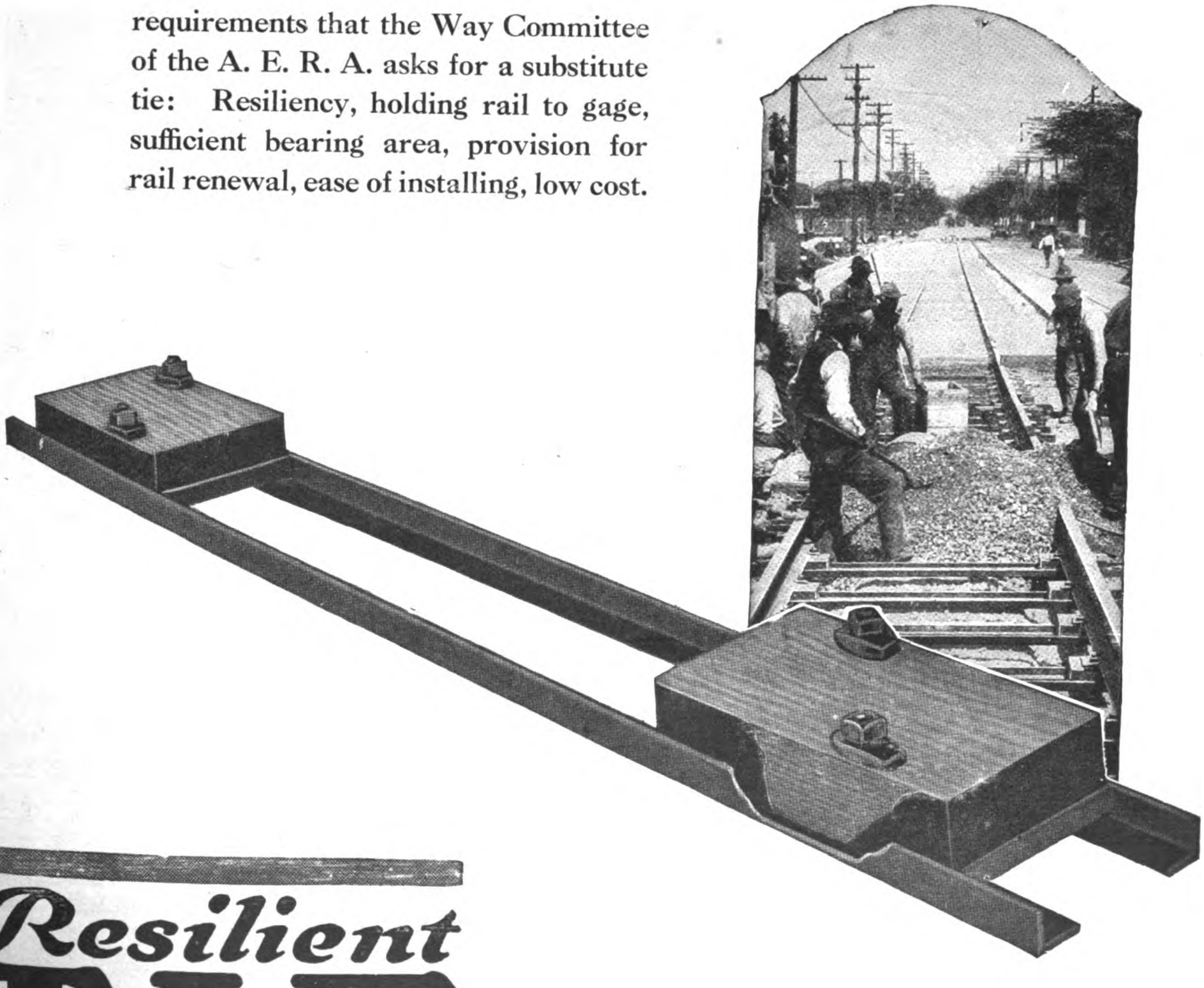
The Dayton
Mechanical Tie Co.
707 Commercial Building, Dayton, Ohio
Canadian Representative:
Lyman Tube and Supply Co., Ltd., Montreal, Quebec

DAYTON

Rolling Stock

the Beginning

The Dayton Resilient Tie meets all the requirements that the Way Committee of the A. E. R. A. asks for a substitute tie: Resiliency, holding rail to gage, sufficient bearing area, provision for rail renewal, ease of installing, low cost.



Resilient

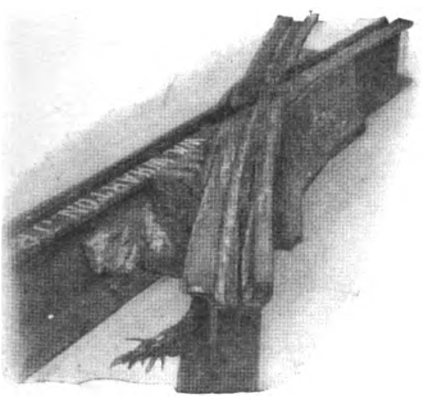
TIE

The solid, substantial character of **COLLIER SERVICE** has placed it high among those permanent organizations recognized as National Institutions

Barron G. Collier
INCORPORATED

TAYLOR-WHARTON IRON & STEEL CO.

TIOGA STEEL & IRON CO. | Wm WHARTON Jr. & CO. Inc. | PHILADELPHIA ROLL & MACHe



In Eight Years and Nine Months Nearly Three Million Double-truck Cars Passed Over This Tisco Manganese Steel Centre Frog

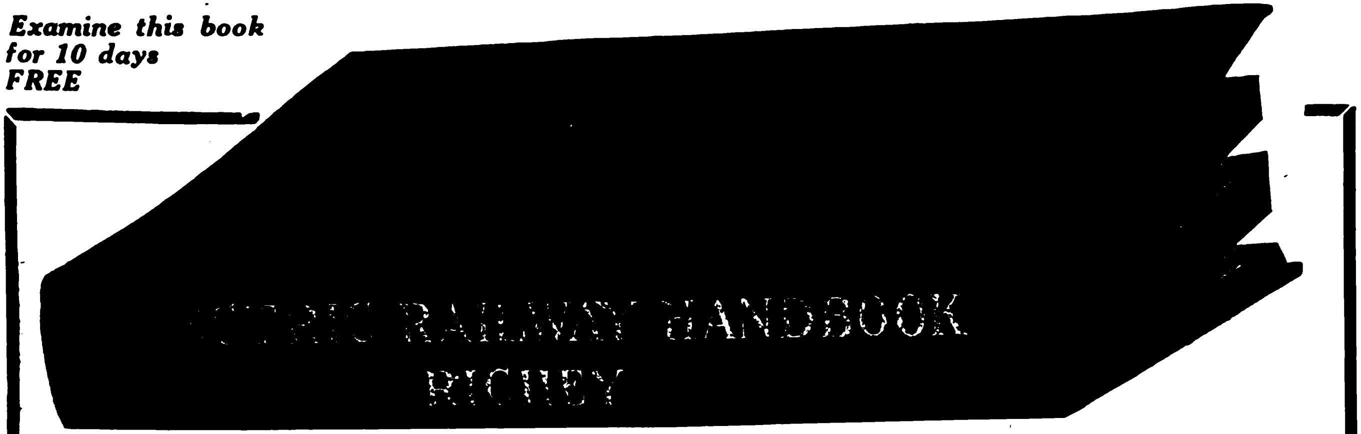
The marvelous wear-resisting qualities of Tisco Manganese Steel Centre Frogs are well demonstrated in this type "K.C.," over which passed 2,865,000 double-truck cars in eight years and nine months. The unusual serviceability of Tisco Manganese steel trackwork has been a big factor in keeping down maintenance costs.

Our engineering staff, working with the foremost American and European railway engineers, has developed various types of trackwork unsurpassed for long service. *We would be glad to recommend the type most suitable for your purposes.*

Wm. Wharton, Jr., & Co., Inc.
Easton, Pa.

Taylor-Wharton Iron & Steel Co.	Wm. Wharton Jr. & Co.	Tioga Steel & Iron Co.	Phila. Roll & Machine Co.
Plant at High Bridge, N. J.	Plant at Easton, Pa.	Plant at Philadelphia, Pa.	Plant at Philadelphia, Pa.
Manganese Steel Wearing Parts	Special Trackwork Cylinders for Gases	Hammered and Pressed Forgings	Rolls and Rolling Mill Machinery

Examine this book for 10 days FREE



Richey's

Electric Railway Handbook

832 *pages, flexible.* 4 *x* 7, *over* 600 *illustrations,* $4.00 *net, postpaid.*

A pocket encyclopædia of practical information on electric railway work. This book contains the data, formulae and tables that are constantly required by the operating, constructing or designing engineer. It is a book which may be used by the non-technical manager as well as the engineer.

The first step to bigger pay—

I. Roadbed and Track.
II. Train Movements.
III. Train Movements.
IV. Railway Motors.
V. Controlling Apparatus.
VI. Current Collecting Devices.
VII. Trucks.
VIII. Braking.
IX. Rolling Stock.
X. Transmission and Distribution.
XI. Signals and Communication.

Free Examination Coupon

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y.

You may send me on 10 days' approval Electric Railway Handbook, $4.00 net. I agree to pay for the book or return it postpaid within 10 days of receipt.

Regular subscriber to the Electric Railway Journal?..........
Member of A. I. E. E. or A. E. R. A.?..........
Signed ....
Address ....
Official position..........
Name of company..........
(Books sent on approval to retail purchasers in the U. S. and Canada only.) F.E

Your Passengers Will Enjoy Their Ride On

Hale-Kilburn Seats

Especially Designed for
One Man Safety Cars

Lightest Weight Stationary Steel Seat

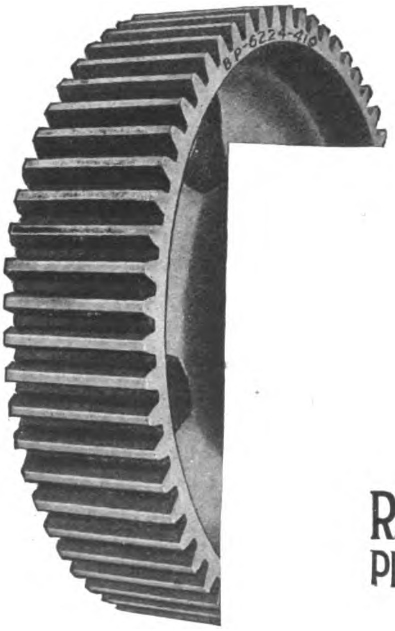
Lightest
Strongest
Simplest
Neatest

Lightest Weight Walkover Steel Seat

No higher in price than others
Write for particulars

Hale-Kilburn Company
PHILADELPHIA

New York 30 Church St.
Chicago McCormick Bldg.
Richmond Mutual Bldg.
Atlanta Candler Bldg.
San Francisco 71 First St.
Los Angeles 447 E. 3rd St.



Nuttall

Can You Get This Guarantee With Any Other Gears, At Any Price?

We guarantee Nuttall BP Gears to last four times as long as untreated gears in the same service, and that means a cost saving of about 70%. If they are Helical Gears, they will last still longer and greatly reduce motor maintenance.

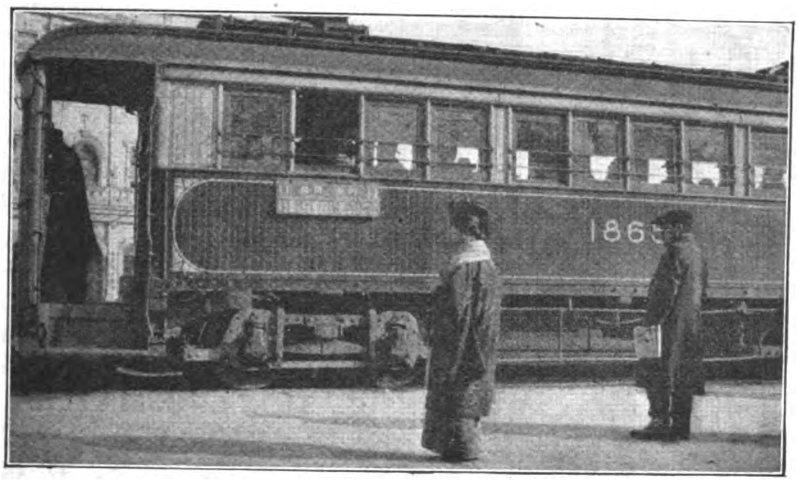
Do you want a trial set?

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

MEMBER AERA

All Westinghouse Electric and Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

Baldwin Electric Motor Trucks in Japan



The illustration shows a car in the city service equipped with Baldwin Class "L" Electric Motor Trucks. Where two-motor equipment is used, this truck is very satisfactory. The motors are outside hung, thus permitting of a short wheel base.

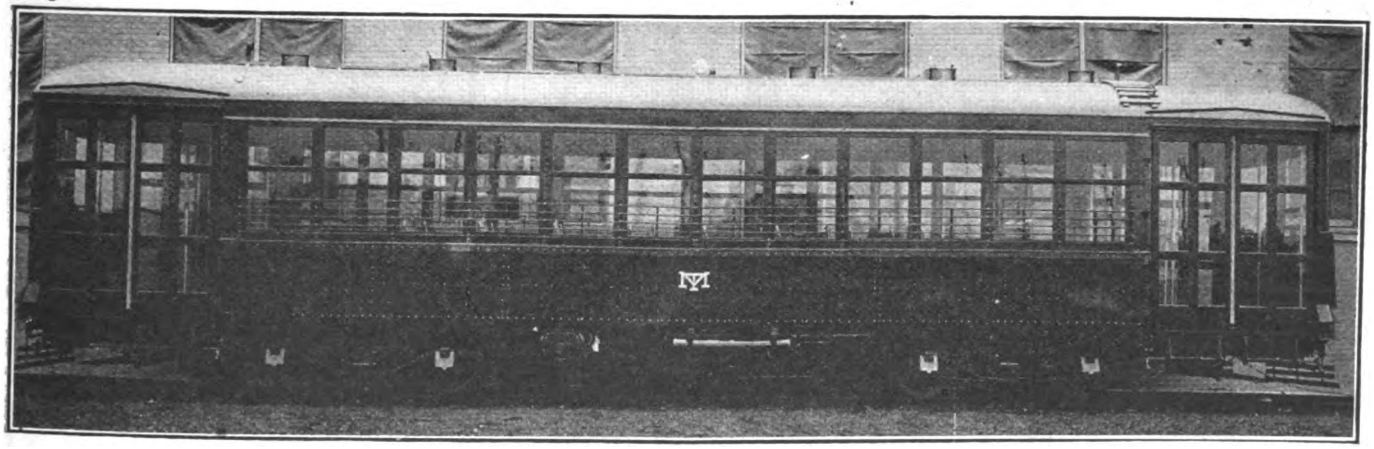
Cars equipped with these trucks may be readily repaired in railway shops.

Among the features of this truck are simplicity in construction, economy in current used and low cost of maintenance.

Speed in construction and delivery is a feature of Baldwin Service.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U. S. A. Cable Address, "Baldwin, Philadelphia"



More and more companies want—

UNIVERSAL SAFETY CARS

Its high capacity (54 seats)—light weight (15 tons)—and one- or two-man operating arrangements have made it the outstanding recent advance in electric railway car design. Instant popularity has been its achievement. Can you use such a car?

Write for specifications

Of course they are "QUALITY" CARS

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"

AMERICAN ELECTRICAL WORKS AMELECTRIC WIRES AND CABLES PHILLIPSDALE, R.I.

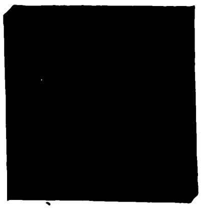
Reg. U. S. Pat. Office

Incandescent Lamp Cord

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

DUNDEE "A" AND "B" FRICTION TAPES



Great Adhesive Strength
High Quality
Long Life
Price Right

FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

Write for Samples and Circulars

THE OKONITE CO., Passaic, N. J.
Incorporated 1884
Sales Offices: *New York—Atlanta—Pittsburgh—San Francisco*
Agents: Central Electric Co., Chicago, Ill. Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Ltd., Montreal

OKONITE TRADE MARK REG. U.S. PAT. OFFICE

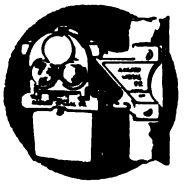
PEIRCE
Railway Feeder Pins

A strong Forged Steel Pin designed for heavy duty. Their low cost permits their use over the entire system.

HUBBARD & COMPANY
PITTSBURGH CHICAGO

AUTOMATIC SIGNALS
Highway Crossing Bells
Headway Recorders

NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KENTUCKY.

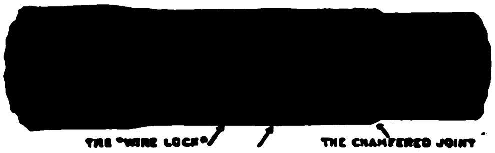


Shaw Lightning Arresters
Standard in the Electric Industries
for 35 years

Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

ELRECO TUBULAR POLES



COMBINE
Lowest Cost Lightest Weight
Least Maintenance Greatest Adaptability
Catalog complete with engineering data sent on request

ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
NewYork City, 30 Church Street

AETNA INSULATION LINE MATERIAL
Third Rail Insulators, Trolley Bases, Harps and Wheels, Bronze and Malleable Iron Frogs, Crossings, Section Insulators, Section Switches

Albert & J. M. Anderson Mfg. Co.
289-93 A Street Boston, Mass.
Established 1877
Branches—New York, 135 B'way
Philadelphia, 429 Real Estate Trust Bldg. Chicago, 165 So. Dearborn St.
London, 12 Moor Lane, E. C. 2

METAL SAFETY CROSS TIES
Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.

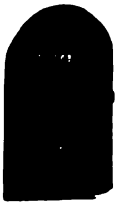
REVOLUTIONIZES ROADBEDS
Write for descriptive folder and quotation.
METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

Lapp Insulators
Lapp Insulator Co., Inc. LeRoy, N.Y.
Trade Mark

ANACONDA
TROLLEY WIRE
ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.
THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

Standard Underground Cable Co.
BOSTON PHILADELPHIA PITTSBURGH DETROIT
NEW YORK WASHINGTON CHICAGO ST. LOUIS SAN FRANCISCO

Chapman
Automatic Signals
Charles N. Wood Co., Boston



Lorain Special Trackwork Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE
CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

Bethlehem Products for Electric Railways

Solid Manganese Tongue Switch, Design 905

Frogs, Switches, Special Trackwork, Rails, Car Wheels, Gear Blanks, Axles, Armature Shafts, Splice Bars, Bolts, Spikes, and Track Accessories.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
Sales Offices in the Following Cities:
New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Cincinnati Detroit Chicago St. Louis San Francisco

SPECIALISTS
in the
Design and Manufacture
of
Standard—Insulated—and Compromise Rail Joints

The Rail Joint Company
61 Broadway, New York City

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

BARBOUR-STOCKWELL CO.
205 Broadway, Cambridgeport, Mass.
Established 1858

Manufacturers of
Special Work for Street Railways
Frogs, Crossings, Switches and Mates
Turnouts and Cross Connections
Kerwin Portable Crossovers
Balkwill Articulated Cast Manganese Crossings

ESTIMATES PROMPTLY FURNISHED

BUDA
ESTABLISHED
1881

Special Track Equipment and Layouts of all kinds

THE BUDA COMPANY
Harvey (Suburb Chicago) Illinois

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

BRANCH OFFICES

BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES

DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

THE WORLD'S STANDARD

"IRVINGTON"

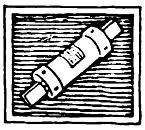
Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper

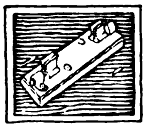
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

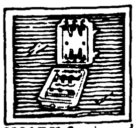
Irvington Varnish & Insulator Co.
Irvington, N. J.

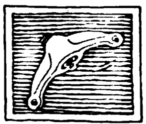
Sales Representatives in the Principal Cities

J-P Products of interest to Electric Railways

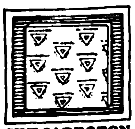

NOARK *Fuses*


NOARK *Fuse Clips*
CUTOUT BASES


NOARK *Service and Underground Boxes*


Railway and Mine hangers and insulators

J-P Molding Service [Contract Basis]

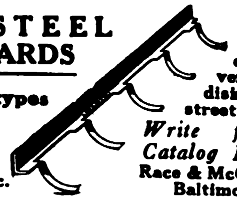

VULCABESTON
Sheet and Rope Packing

JOHNS-PRATT CO. HARTFORD, CONN.

GODWIN STEEL PAVING GUARDS

Adapted to all types of rails and paving.

W. S. GODWIN CO., Inc.



Proven by service to economically prevent seepage and disintegration of street railway paving.

Write for Illustrated Catalog No. 20.

Race & McComas Sts., Baltimore, Md.

RAMAPO AJAX CORPORATION

Ramapo Automatic Return Switch Stands for Passing Sidings

RACOR
TRADE MARK

RACOR Tee Rail Special Work.

Manganese Construction

GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

BUCKEYE JACKS

high-grade R. R. Track and Car Jacks

The Buckeye Jack Mfg. Co.
Alliance, Ohio

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

A Single Segment or a Complete Commutator

is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

Cameron Electrical Mfg. Co., Ansonia, Connecticut

ERICO Rail Bonds

THE ELECTRIC RAILWAY IMPROVEMENT CO.
CLEVELAND, OHIO

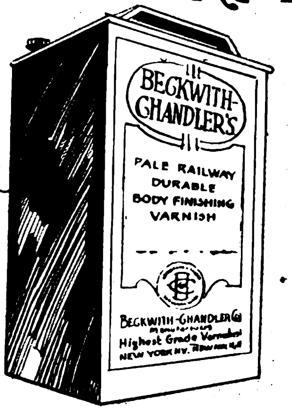
FOSTER SUPERHEATERS

A necessity for turbine protection, engine cylinder economy and utilization of superheat for all its benefits

POWER SPECIALTY COMPANY, 111 BROADWAY, NEW YORK

Boston Philadelphia Pittsburgh Detroit Kansas City Dallas Chicago San Francisco London, Eng.

Memorize the label


BECKWITH-CHANDLER'S
PALE RAILWAY DURABLE BODY FINISHING VARNISH
BECKWITH-CHANDLER Co.
Highest Grade Varnishes
NEW YORK N.Y. NEWARK N.J.

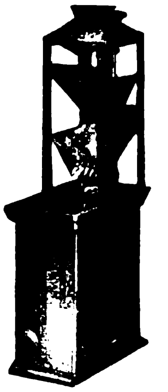
Memorize the Label

The Beckwith-Chandler label brands the contents of each can as the highest possible achievement in durable, economical, super-quality paints and varnishes, especially compounded to meet transportation needs.

Full details on request

The Beckwith-Chandler Company
193-211 Emmett St., Newark, N. J.
320 Fifth Avenue, New York
Highest Grade Paints and Varnishes.

The Superiority of the
CLEVELAND

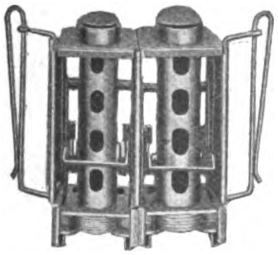


is NOT based solely on its ability to increase earnings—it does that from the mere fact that it is a FARE Box. It is not individual in its method of collecting fares—but it IS individual in its method of handling them, of safeguarding them and doing this efficiently. Given the details of construction and operation, you realize at a glance its Safety, Simplicity, Durability, Flexibility and Economy in Operation.

Let Us Put the Box Before You and Quote Prices.

The Cleveland Fare Box Co.
Cleveland, Ohio
Canadian Cleveland Fare Box Co., Ltd., Preston, Ont.

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

International Registers

193
IN
10224

Type R-10

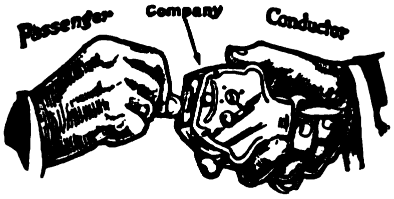
Made in various types and sizes to meet the requirements of service on street and city system. Complete line of registers, counters and car fittings.

Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

Heywood-Wakefield
CAR SEATS
of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.
HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York, Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition



Direct Automatic Registration By the Passengers
Rooke Automatic Register Co.
Providence, R. I.

PS HEATERS

Car Heating and Ventilation
are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

ELECTRIC CAR HEATERS
THERMOSTATS BUZZERS
PNEUMATIC DOOR OPERATORS
CONSOLIDATED CAR-HEATING CO.
NEW YORK ALBANY, N.Y. CHICAGO

OHMER
FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

T. S. Q.
Says
"They don't shop and overhaul the cars as often since I've been on the job"

Tool Steel Quality

The Tool Steel
Gear and Pinion Co.
CINCINNATI, O.

B. A. HEGEMAN, Jr., President
C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas.
F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.
Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

Waterproofed Trolley Cord

SILVER LAKE A

Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.

FOR POSITIVE SATISFACTION ORDER
SILVER LAKE

If you are not familiar with the quality you will be surprised at its ENDURANCE and ECONOMY.

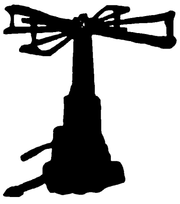
Sold by Net Weights and Full Lengths

SILVER LAKE COMPANY
Manufacturers of bell, signal and other cords.
Newtonville, Massachusetts

PROVIDENCE
FENDERS

H-B
LIFE GUARDS

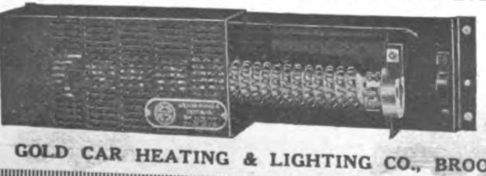
The Consolidated Car Fender Co., Providence, R. I.
Wendell & MacDuffie Co., 110 E. 42nd St., New York
General Sales Agents



Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars

Perey Manufacturing Co., Inc.
30 Church Street, New York City

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No. 478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

RAILWAY UTILITY COMPANY
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings;
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for Catalogue

1328 Broadway
New York, N. Y.

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches	$4.50 an inch
4 to 7 inches	4.30 an inch
8 to 14 inches	4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E.F J.

POSITIONS VACANT

SUPERINTENDENT for high-speed interurban line, consisting of 107 miles in central territory. One who has had experience covering the installation and operation of light weight, one man operated interurban cars, preferred. P-674, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

WANTED: Foreman for welding shop, experienced in gas and electrical welding in a Middle West town. In application give references and salary expected. P-670, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

AS CLAIM agent, or commerce attorney, age 38, married, Yale graduate in law, now employed, and have been for past five years, with short line, interstate road; specially qualified in Federal and State laws pertaining to railways in practice before the I. C. C. and State Commissions, as well as in the adjustment of claims. PW-661, Electric Railway Journal, 10th Ave. at 36th St., New York.

AS M. M. or with chance for advancement. Experienced low and high voltage DC. equipment, passenger and freight, city and interurban. Expert on motor and controller repairs. PW-672, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

GENERAL foreman, experienced on all branches of electric railroading, on city and interurban cars, and locomotives, equipment. PW-665, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

GRADUATE civil engineer desires permanent position, experienced in construction and design of subway and street railway tracks, valuation, rehabilitation, maintenance, welding, pavements and executive and contractors engineer. PW-675, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

MR. PRESIDENT! Do you require the services of a manager who is loyal and has character, ability, initiative and who can receive as well as issue instructions? Can show creative ability—visit me on the job. Want to reach the top. Present position very limited. PW-676, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

SUPERINTENDENT of city and interurban road operating fifty cars, seeks similar position affording greater opportunity for advancement. Successful in maintenance, operation and public relations. Age 35; salary $3,600. PW-673, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT of transportation at present with large successful property that has been placed on sound basis largely through efforts of advertiser, solicits correspondence with managers of city, suburban and interurban properties that require a capable progressive superintendent; 19 years' experience under high-grade executives on large properties; quick to locate leaks and correct same; fully competent to take over all details and build up an organization that would be a credit to any property. Successful in dealing with public and labor in a manner that will get results; will consider any good size property that requires extra effort to get results. Best of references. Personal reasons for desiring a change. PW-664, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

WANTED to locate with city or interurban railway in equipment, distribution, purchasing, construction, traffic and transportation or other capacity requiring engineering ability. Over ten years' experience in railway and power manufacturing, installation, operating. Your proposition solicited. PW-651, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

RAILS WANTED

235 tons, 6-in. High T or Shanghai.
72 lb. to 95 lb. per yd.
State Price, Condition, Location.

W-669, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

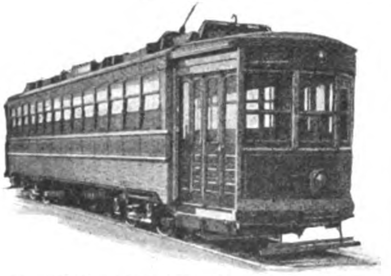
FOR SALE

Electric Locomotive

Standard G. E. 50-ton Locomotive in first-class condition. Locomotive may be seen in daily operation.

ALBANY SOUTHERN R. R. CO.,
Rensselaer, N. Y.

FOR SALE



20 ALL STEEL CARS

Length over bumpers	50 ft. 10 in.
Length over corner posts	36 ft. 6 in.
Width over all	8 ft. 7 in.
Height over all	11 ft. 7½ in.

Cars are complete and ready for operation including WH air brakes. Seat 52 people.

TRUCKS

Standard 050 4 ft., 10-in. wheel base.

ELECTRICAL EQUIPMENT

Consists of 4 WH-514 motors and K35 controllers for double end operation.

Code "Cun"

Transit Equipment Company
Cars—Motors
501 Fifth Avenue, New York.

FOR SALE

Deck Plate Girder Bridge

built for electric railway by American Bridge Co. 61 ft. long, 20 tons weight.

For particulars address

York Utilities Company
Kennebunk, Maine.

FOR SALE

- **50—G. E. No. 80-A Motors.**
- **50—Controllers, K-28-B; K-12.**
- **35—B-2 Compressors.**

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

Competent Men Are Watching—

for the opportunity you have to offer, Mr. Employer. You can secure the best available man for the work through an ad in the

SEARCHLIGHT SECTION

That's where they are looking for your announcement
The cost is small.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with
Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
St. Louis Car Co.
Westinghouse E. & M. Co.

Babbitt Metal
Ajax Metal Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co., The

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
Brill Co., J. G., The
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Consolidated Car Heati'g Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Boilers
Babcock & Wilcox Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Brill Co., The J. G.
National Ry. Appliance Co
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co.
National Brake Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Westinghouse E. & M. Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Cables. (See Wires and Cables.)

Cambric Tapes, Yellow and Black Varnish
Irvington Varnish & Ins. Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
Brill Co., J. G., The
Differential Steel Car Co.
St. Louis Car Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heati'g Co.
Westinghouse E. & M. Co.

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Gas, Rail
Brill Co., J. G., The
St. Louis Car Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

Cars, Self-Propelled
Brill Co., J. G., The
General Electric Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
Bemis Car Truck Co.
St. Louis Car Co.

Castings, Malleable and Brass
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
St. Louis Car Co.

Catchers and Retrievers, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Elec. Service Supplies Co.

Coils Armature and Field
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
Intern'l Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Elec. Service Supplies Co.
General Electric Co
Westinghouse E. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
General Electric Co.
Westinghouse E & M. Co.

Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.

Compressors, Air Portable
Ingersoll-Rand Co.

Condensor Papers
Irvington Varnish & Ins. Co.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Consolidated Car Heat. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St Louis Car Co.
Westinghouse Tr. Br. Co.

Cranes
American Engineering Wks.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossing, Frog & Switch
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Crossing, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.

Crossings
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co.
Transit Equipment Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G.
Consolidated Car H't'g Co.
General Electric Co.
Hale-Kilburn Co.
Nat'l Pneumatic Co., Inc.
St. Louis Car Co.

Doors & Door Fixtures
Brill Co., The J. G.
Consolidated Car Heati'g Co.
General Electric Co.
Hale-Kilburn Co.
Morton Mfg. Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.

Ears
Ohio Brass Co.

Electrical Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Roebling's Sons & Co., J. A.

Electric Grinders
Railway Track-work Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbins, J. Rowland
Buchanan & Lay Corp.
Day & Zimmerman, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelly-Cooke & Co.
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Railway Audit & Inspection Co.
Richey, Albert S.
Sanderson & Porter
Stevens & Wood
Stone & Webster
White Eng. Corp., The J. G.
Wortham, Edwin

Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.

Fare Registers
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Flangeway Guards, Steel
Godwin Co., Inc., W. S.

Floodlights
Elec. Service Supplies Co.

Forgings
Brill Co., J. G., The

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Funnell Castings
Wharton, Jr. & Co., Wm.

Fuses and Fuse Boxes
Consolidated Car Heati'g Co.
General Electric Co.
Westinghouse E. & M. Co

Fuses, Cartridge, Non-Refillable & High Voltage
Johns-Pratt Co.

Fuses, Refillable
General Electric Co.
Johns-Manville, Inc.
Johns-Pratt Co.
Power Specialty Co.

Gaskets
Westinghouse Tr. Br. Co.

Gas Producers
Westinghouse E. & M. Co.

Gas-Electric Cars
General Elec. Co.
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.
Brill Co., J. G., The

Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gong (See Bells and Gongs)

Greases (See Lubricants)

Grinders and Grind. Supplies
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Bricks and Wheels
Railway Track-work Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson Mfg. Co., A.&J.M
Elec. Service Supplies Co.
More-Jones Brass Metal Co.
Nuttall Co., R. D.
Star Brass Works
Thornton Trolley Wheel Co.

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Heaters, Car (Electric)
Consolidated Car Heati'g Co.
Gold Car Heat. & Ltg. Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Elec. Service Supplies Co.
Smith Heater Co., Peter

Helmets—Welding
Railway Track-work Co.

Hoists, Portable
Ingersoll-Rand Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating Signals
Oskel Equipment Co.

Instruments Measuring, Testing and Recording
Elec. Service Supplies Co.
General Electric Co.
Johns-Pratt Co.
Westinghouse E. & M. Co

Insulating Cloth, Paper and Tape
General Electric Co.
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Stand. Underground Cable Co.
Westinghouse E. & M. Co.

Insulating, Silk & Varnish
Irvington Varnish & Ins. Co.

Insulation (See also Paints)
Anderson Mfg. Co., A. & J. M.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Westinghouse E. & M. Co.

Insulation Slots
Irvington Varnish & Ins. Co.

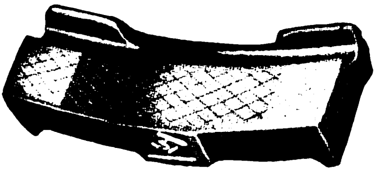
Insulators (See also Line Materials)
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.

Brake Shoes
A.E.R.A. Standards

Diamond "S" Steel Back is the Best Type

Standard Patterns for

SAFETY CAR



D-67 for Narrow Treads
D-87 for Wide Treads

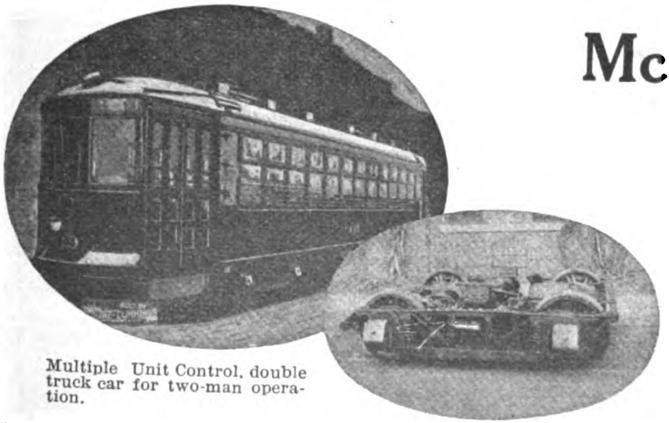
American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

Ingersoll-Rand Pneumatic Tie Tampers

Reduce track tamping and maintenance costs.

Ask for Bulletin 9123

INGERSOLL-RAND COMPANY
11 Broadway, New York
170-TT



Multiple Unit Control, double truck car for two-man operation.

McGUIRE-CUMMINGS
Manufacturing Company

General Offices
111 W. Monroe St., Chicago, Ill.

Street Cars
Trucks

TULC
A LUBRICANT

We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC on your equipment

The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

MORE-JONES "TIGER" BRONZE
AXLE & ARMATURE BEARINGS

Strong-tough-durable
anti-frictional
economical

MORE-JONES BRASS & METAL CO
ST. LOUIS MISSOURI

General Electric Co.
Irvington Varnish & Ins. Co
Ohio Brass Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Cranes, Hoists and Lifts)
Buckeye Jack Co.
Buda Co.
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
Anderson Mfg. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.
Ohio Brass Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Protection
Anderson Mfg. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson Mfg. Co., A.&J.M.
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Wharton, Jr. & Co., Wm.

Locomotives, Electric
Baldwin Locomotive Works
General Electric Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricating Engineers
Galena Signal Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co
Universal Lubricating Co.

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Castings
Wharton, Jr. & Co., Wm.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.
Wharton, Jr. & Co., Wm.

Manganese Steel Switches Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters (See Instruments)

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses (See Buses, Motor)

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
Allis-Chalmers Mfg. Co.
General Electric Co.

Motormen's Seats
Brill Co., J. G.
Elec. Service Sup. Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Barbour-Stockwell Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Hubbard & Co.

Oils (See Lubricants),

Omnibuses (See Buses, Motor)

Oxy-Acetylene (See Cutting Apparatus, Oxy-Acetylene)

Packing
Elec. Service Supplies Co.
Power Specialty Co.
Westinghouse E. & M. Co.

Paints and Varnishes (Insulating)
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.

Paints, Varnishes, Preservatives
Beckwith-Chandler Co.

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co

Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdy. Co

Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Power Specialty Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Elec. Ry. Equipment Co.
Hubbard & Co.

Pole Reinforcing
Hubbard & Co.

Poles & Ties Treated
Bell Lumber Co.

Poles, Ties, Posts, Piling & Lumber
Bell Lumber Co.

Poles, Trolley
Bell Lumber Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

Porcelain Special High Voltage
Lapp Insulator Co., Inc.

Portable Grinders
Buda Co.

Potheads
Okonite Co.

Power Saving Devices
National Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Ohio Brass Co
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Rail Joint Co., The

Rail Joints—Welded
Lorain Steel Co.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Rail Welding
Railway Track-work Co.

Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Ohmer Fare Register Co.
Rooke Automatic Rg. Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Elec. Service Sup. Co.

Resistances
Consolidated Car Heat. Co.

Resistance, Wire and Tube
General Electric Co.
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Sanders, Track
Brill Co., The J. G.
Elec. Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
St. Louis Car Co.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.

Seats, Bus
Brill Co., J. G., The
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co, The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co.
Transit Equipment Co.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings, Center and Side)

Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
Wood Co., Chas. N.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A.&J.M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
More-Jones Metal & Brass Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Irvington Varnish & Ins. Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Steel and Steel Products
Carnegie Steel Co.

Steel Castings
Wharton, Jr. & Co., Wm.

Steps, Car
Brill Co., J. G., The
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Subway Boxes
Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.
Power Specialty Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switches, Safety
Johns-Pratt Co.

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Switches and Switchboards
Anderson Mfg. Co., A.& J.M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Tamper Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.

Terminals, Cable
Std. Underground Cable Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heat. Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

Ties, All-Metal
Metal Safety R. R. Tie Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

Ties and Tie Rods, Steel
Barbour-Stockwell Co.
Carnegie Steel Co.
International Steel Tie Co.

Tool Steel
Bethlehem Steel Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Tongue Switches
Wharton, Jr. & Co., Wm.

Torches, Acetylene (See Cutting Apparatus)

Towers and Transmission Structures
Archbold-Brady Co.
Westinghouse E. & M. Co.

Track Expansion Joints
Wharton, Jr. & Co., Wm.

Track Grinders
Railway Track-work Co.

Trackless Trolley Cars
Brill Co., J. G., The
St. Louis Car Co.

Track, Special Work
Barbour-Stockwell Co.
Bethlehem Steel Co.
Buda Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Transfer (See Tickets)

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Material, Overhead
Elec. Service Supplies Co
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolley Wheel Bushings
More-Jones Brass & Metal Co.

Trolley Wheels & Harps
More-Jones Brass & Metal Co.
Thornton Trolley Wheel Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Roebling's Sons Co., J. A.

Trucks, Car
Baldwin Locomotive Works
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Tubing, Yellow & Black Flexible Varnish
Irvington Varnish & Ins. Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Turbines, Water
Allis-Chalmers Mfg. Co.

Turnstiles
Elec. Service Supplies Co.
Perey Mfg. Co., Inc.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers & Silks
Irvington Varnish & Ins. Co.

Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Welded Rail Joints
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welders, Portable Electric
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
General Electric Co.
International Oxygen Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Welding Steel
Elec. Ry. Improvement Co.
Railway Track-work Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.
Carnegie Steel Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

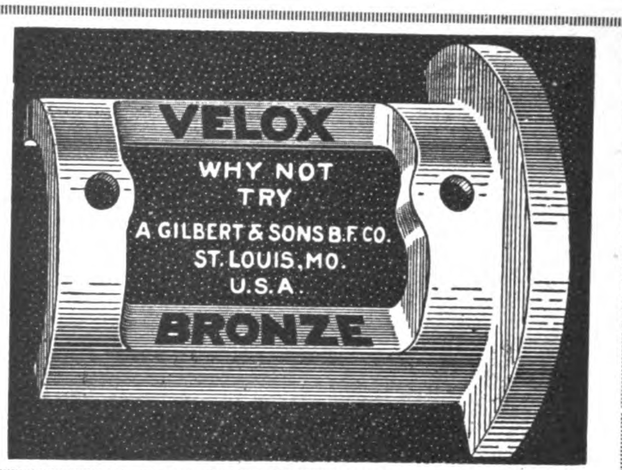
Wire Rope
Roebling's Sons Co., J. A.

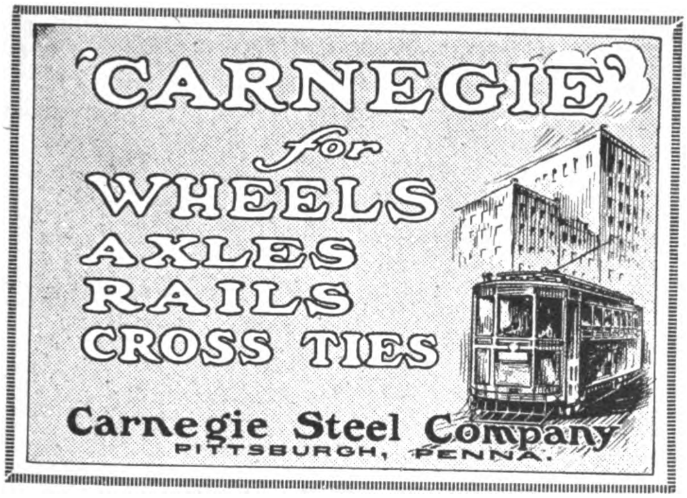
Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Okonite Co.
Roebling's Sons Co., J. A.
Std. Underground Cable Co.
Westinghouse E. & M. Co.

The Kalamazoo Trolley Wheels

have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.

THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

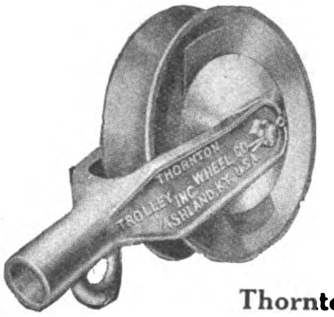

VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE



Traction Experts Sing the Praise of THORNTON Trolley Wheels

"Best I have ever seen for high speed cars," says the master-mechanic of the Cincinnati Traction Co. "Almost impossible to wear out," says an official of the Ohio Valley Electric Railway Co. and so it goes. They are built to outlast, outclass and outrun all other trolleys—and they are doing it.. An investigation will prove it.

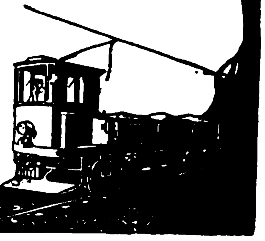
Thornton Trolley Wheel Co.
Incorporated
Ashland, Kentucky



The Differential Car

An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.

The Differential Steel Car Co.
Findlay, Ohio



AJAX
M.C.B. 3¾X7

IN THE REPAIR SHOPS
There are many cars *not* equipped with

AJAX CAR BRASSES

The cars that *are* equipped with Ajax Brasses keep on the road, day after day

The Ajax Metal Company
Established 1880
Philadelphia, Pa.
NEW YORK CHICAGO BOSTON CLEVELAND

N-L VENTILATORS
for Electric Railways and Motor Buses.
Unexcelled for ventilation and appearance.
Write for new catalogue

THE NICHOLS-LINTERN COMPANY
7960 Lorain Ave., Cleveland, Ohio
N-L Products manufactured and sold in Canada by
Railway and Power Engineering Corporation, Ltd.
133 Eastern Avenue, Toronto, Ontario

"Boyerized" Products Reduce Maintenance

Bemis Trucks
Case Hardened Brake Pins
Case Hardened Bushings
Case Hardened Nuts and Bolts
Manganese Brake Heads
Manganese Transom Plates
Manganese Body Bushings
Bronze Axle Bearings

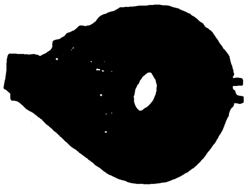
Bemis Pins are absolutely smooth and true in diameter. We carry 40 different sizes of case hardened pins in stock. Samples furnished. Write for full data.

Bemis Car Truck Co., Springfield, Mass.

"OSKELITE"

The Stop Light for street cars. Operates from brake system. Details on request.

The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.



CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. *Write Us.*
Chillingworth Mfg. Co.
Jersey City, N. J.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page

A

Ajax Metal Co 39
Allis-Chalmers Mfg. Co 32
Allison Co., J. E 23
Alumino-Thermic Corp. 40
Amer. Brake Shoe & Fdy. Co ... 37
American Car Co 41
American Electrical Works 30
American Steel & Wire Co 31
Anaconda Copper Mining Co 30
Anderson Mfg. Co., A. & J. M .. 30
Archbold-Brady Co 23
Arnold Co., The 22

B

Babcock & Wilcox Co 32
Baldwin Locomotive Works 29
Barbour-Stockwell Co 31
Beckwith Chandler Co 33
Beeler, John A 22
Bell Lumber Co 40
Bemis Car Truck Co 39
Bethlehem Steel Co 31
Bibbins, J. Rowland 22
Bonney Vehslage Tool Co 40
Brill Co., J. G 41
Buchanan & Layng Corp 23
Buckeye Jack Mfg. Co 32
Buda Co 31

C

Cameron Electrical Mfg. Co 32
Carnegie Steel Co 39
Chillingworth Mfg. Co 39
Cleveland Fare Box Co 33
Collier, Inc., Barron G. Co 26
Consolidated Car Fender Co 34
Consolidated Car Heating Co 33

D

Day & Zimmermann Co., Inc ... 22
Dayton Mechanical Tie Co ... 24-25
Differential Steel Car Co 39

Page

E

Electric Equipment Co 35
Electric Railway Equipment Co. 30
Electric Ry. Improvement Co ... 32
Electric Service Supplies Co. Front Cover

F

Ford, Bacon & Davis 22
"For Sale" Ads 35

G

Galena-Signal Oil Co 13
General Electric Co. . 14, Back Cover
Gilbert & Sons Brass Foundry Co., A 39
Godwin Co., W. S 32
Gold Car Heating & Ltg. Co ... 34

H

Hale-Kilburn Company 28
"Help Wanted" Ads 35
Hemphill & Wells 22
Heywood-Wakefield Co 33
Holst Englehard W 22
Hubbard & Co 30

I

Ingersoll-Rand Co 37
International Register Co., The. 33
International Steel Tie Co 11
Irvington Varnish & Insulator Co. 32

J

Jackson, Walter 22
Johnson & Co., J. R 40
Johns-Pratt Co 32
Johnson Fare Box Co 33

Page

K

Kelly-Cooke Co 22
Kuhlman Car Co 41

L

Lapp Insulator Co., Inc 30
Lorain Steel Co 31

M

McGuire Cummings Mfg. Co 37
Metal Safety Railway Tie Co ... 30
Mitchell-Rand Mfg. Co 23
More-Jones Brass & Metal Co ... 37
Morton Mfg. Co 40

N

Nachod Signal Co., Inc 30
National Brake Co., Inc 21
National Pneumatic Co., Inc 10
National Railway Appliance Co. 34
New York Switch & Crossing Co. 31
Nichols, Lintern Co 39
Nuttall Co., R. D 28

O

Ohio Brass Co 9
Ohmer Fare Register Co 34
Okonite Co., The 30
Ong, Joe R 22
Oskel Equipment Co 39

P

Parsons, Klapp, Brinckerhoff & Douglas 22
Perey Mfg. Co 34
Positions Wanted and Vacant ... 35
Power Specialty Co 32

Page

R

Rail Joint Co 31
Railway Audit & Inspection Co., Inc. 23
Railway Track-work Co 8
Railway Utility Co 34
Ramapo-Ajax Co 32
Richey, Albert S 22
Roebling's Sons Co., John A ... 30
Rooke Automatic Register Co .. 33

S

St. Louis Car Co 29
Samson Cordage Works 40
Sanderson & Porter 22
Searchlight Section 35
Shaw, Henry M 30
Silver Lake Co., The 34
Smith Heater Co., Peter, The .. 33
Standard Underground Cable Co. 30
Star Brass Works 39
Stone & Webster 22
Stevens & Wood, Inc 22
Stucki & Co., A 40

T

Thornton Trolley Wheel Co 39
Tool Steel Gear & Pinion Co 34
Transit Equipment Co 35

U

Universal Lubricating Co 37

W

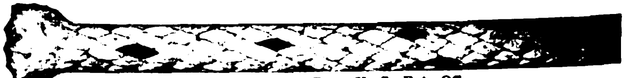
"Want" Ads 35
Wason Mfg. Co 41
Westinghouse Elec. & Mfg. Co. 2, 4-7
Westinghouse Traction Brake Co. 12
Wharton, Jr. & Co., Wm 27
White Engineering Corp., The J. G 22
Wish Service, The P. Edw 23
Wood Co., Chas. N 30
Wortham, Edwin 23

The Most Successful Men in the Electric Railway Industry read the

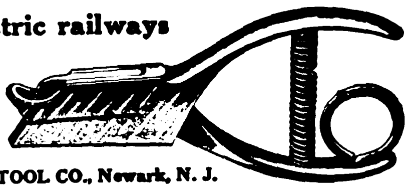
ELECTRIC RAILWAY JOURNAL

Every Week

SAMSON SPOT WATERPROOFED TROLLEY CORD



Trade Mark Reg. U. S. Pat. Off.
Made of extra quality stock firmly braided and smoothly finished.
Carefully inspected and guaranteed free from flaws.
Samples and information gladly sent.
SAMSON CORDAGE WORKS, BOSTON, MASS.

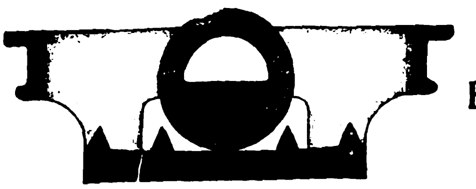


75% of the electric railways use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.

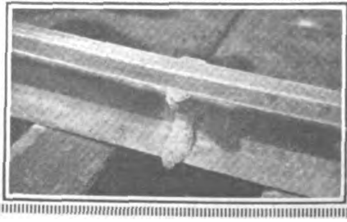
100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

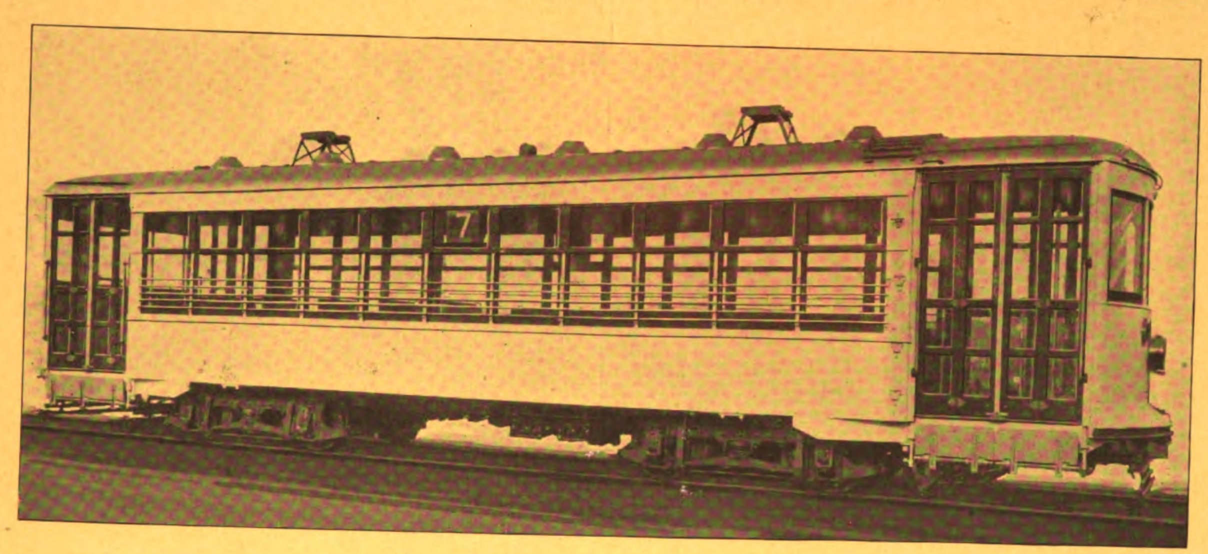


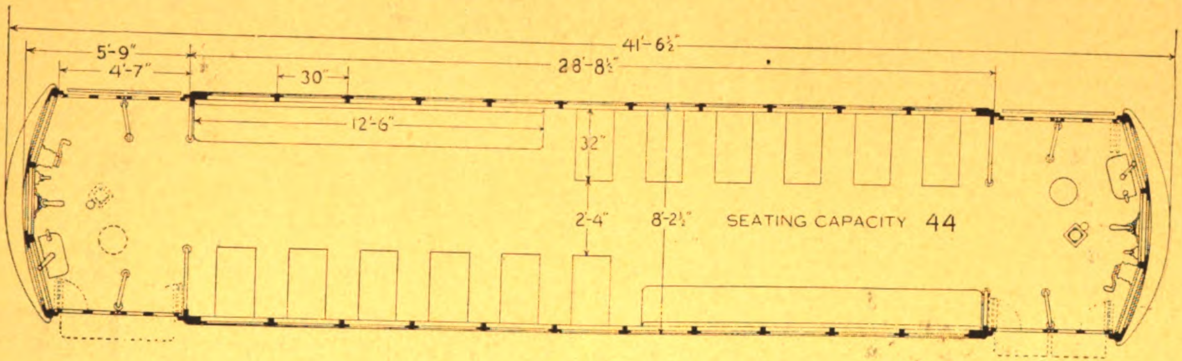
STUCKI SIDE BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.



ALUMINO-THERMIC JOINTS
New and independent process. No inserts needed. Up-to-date and economical.
Alumino-Thermic Corp., Roselle Park, N. J.

SACRAMENTO





Light-Weight Double-End Cars

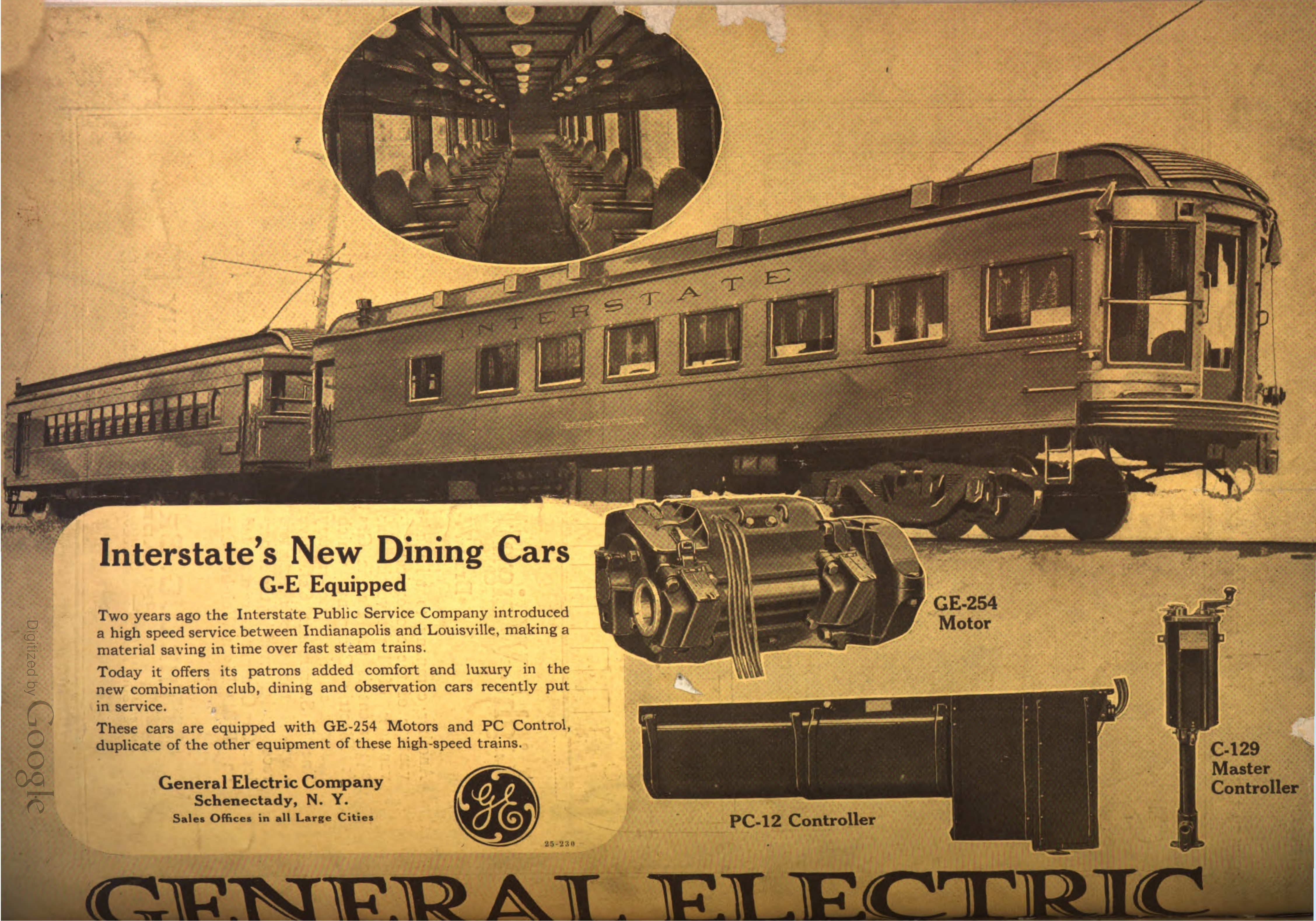
Brill 77-E1 Trucks

Another company to take advantage of the economical advantages of light-weight car equipment is the Pacific Gas & Electric Company, which operates all the street-railway lines in Sacramento, Cal. Five cars of the type illustrated, recently delivered by the American Car Company, are mounted on Brill Light-Weight Car Trucks No. 77-E1, propelled by one 40 Hp. motor on each truck.

The body length is 28 ft. 8½ in.; length over platforms, 41 ft. 6½ in; seating capacity, 44. These cars weigh ready for operation 28,216 lbs.

Our Light-Weight Car Catalog No. 266 will be mailed upon request.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO. G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO WASON MANF'G CO. SPRINGFIELD, MASS.


INTERSTATE
GE-254
Motor
PC-12 Controller
C-129
Master
Controller
GENERAL ELECTRIC

Interstate's New Dining Cars

G-E Equipped

Two years ago the Interstate Public Service Company introduced a high speed service between Indianapolis and Louisville, making a material saving in time over fast steam trains.

Today it offers its patrons added comfort and luxury in the new combination club, dining and observation cars recently put in service.

These cars are equipped with GE-254 Motors and PC Control, duplicate of the other equipment of these high-speed trains.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

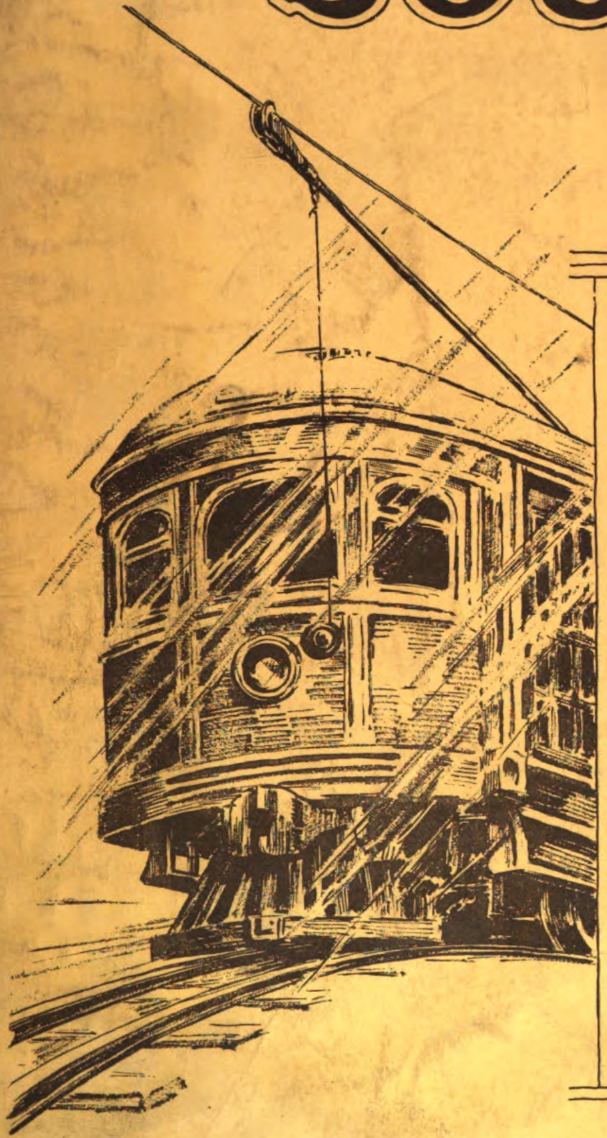
25-230

McGraw-Hill Co., Inc. April 5, 1924 Twenty Cents Per Copy

ELECTRIC RAILWAY JOURNAL

TF
01
17

PROPERTY OF
TECHNICAL PUBLICATIONS LIB
U. OF VA. SCHOOL OF ENGINEERING



Alert!

There's real need for trolley cord to be alert, ready to pay out or wind into the catcher with every swing of the pole. It must be smooth and must not swell or shrink. That's the kind of trolley cord you get when you use Samson Spot Cord. Made of extra quality stock, firmly braided yet flexible, smoothly finished, and thoroughly waterproofed. Guaranteed free from imperfections. The colored spots are our trade-mark.

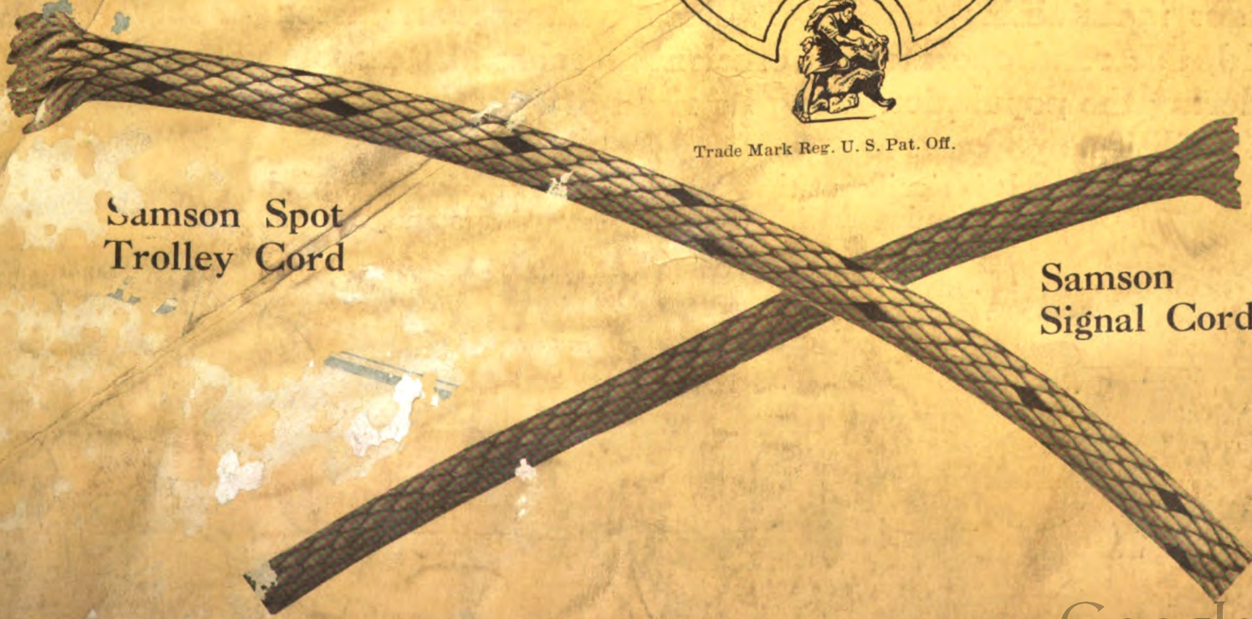
SAMSON BELL AND REGISTER CORD

Same extra quality stock, and same smoothness and uniformity. Drab, Mahogany and White—with wire centre if desired.

Send for Samples and Full Information

Samson Cordage Works
BOSTON,
Mass.

Trade Mark Reg. U. S. Pat. Off.



The Chicago, North Shore & Milwaukee Furnishes
SERVICE

Thos. Cusack Co.
USE THE MERCHANDISE DESPATCH
of the CHICAGO NORTH SHORE & MILWAUKEE R.R.
OVERNIGHT DELIVERY ALWAYS ON TIME
RECEIVING STATIONS 4 IN CHICAGO 2 IN MILWAUKEE
FAST SERVICE BETWEEN
WOODLAWN, CHICAGO MILWAUKEE & INTERMEDIATE POINTS
WESTINGHOUSE ELECTRIC

Besides maintaining the fastest electric interurban passenger service in the world, this road operates an efficient merchandise dispatch service, thereby rendering the population along its right-of-way the maximum of transportation facilities.

It is significant that practically all cars on this road
are equipped with Westinghouse Motors and Control

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pennsylvania

Sales Offices in All Principal Cities of the
United States and Foreign Countries

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

Westinghouse

Vol. 63, *No.* 14 New York, April 5, 1924 *Pages* 529-566

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

MORRIS BUCK
Associate Editor
C. W. SQUIER
Associate Editor
JOHN A. MILLER, JR.
Assistant Editor
G. J. MACMURRAY
News Editor

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago
MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago
CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 529

How Saginaw Has Co-ordinated Railway and Bus 531
Unified system of transportation result of peoples' referendum. Twenty-five modern buses operate on three routes specified in 15-year franchise. Control of system in hands of public. Railway equipment rebuilt and painted.

Concrete Poles Used Because of Ornamental Appearance 534

Twin City Starts Thrift Fund 936

Rail Welding in Connecticut 537
An especially interesting feature of the Connecticut Company's track is the tilted joint plate and base plate, adapted to twenty-three different rail sections. Precautions adopted to secure good results.

Third Track Turnouts Save Nine Minutes Running Time 539

Trackless Trolley Experience on Staten Island 540

Special Sign Painted on Dash 540

Association News and Discussions 541

Optimism Features Illinois Utility Meeting 541
Improvement in spirit attributed to co-operative effort. New speaker's bureau to tell utility story in local talks throughout the state. Railway men discuss publicity, new cars, bus operation and track construction.

Light-Weight Double-Truck Car Design 543
BY H. B. ADAMS.

How the Motor Coach Can Be Utilized in the Transportation System 545
BY G. T. SEELY.

Educating the Public 546
BY LUKE GRANT.

Educating the Management 547
BY W. H. SAWYER.

Education of the North Shore Line Employee 548
BY C. G. GOODSELL.

American Association News 550

Maintenance of Equipment 551

News of the Industry 555

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

MEMBER
AMERICAN ELECTRIC RAILWAY ASSOCIATION
1924

Cable Address: "Machinist, N. Y."
Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingeniería Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

Copyright, 1924, by McGraw-Hill Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

Accurate

NOTHING is more distasteful to the reader of a newspaper or magazine article than to see a statement which he knows to be inaccurate or untrue. Such an occurrence, even though the mistake is a trivial one, tends to destroy the reader's confidence and interest in the story, for he feels that it was written by someone ignorant of the subject.

The utmost care must be exercised to prevent such slips. The wider the scope of a particular publication, the more difficult it is to have every article written by a man adequately posted on his subject. Thus the JOURNAL is required to exercise many precautions to insure accuracy.

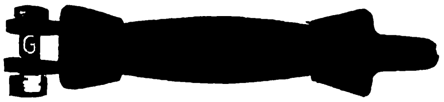
This is no easy task when one remembers that the electric railway industry comprises among its essential phases such subjects as cars, buses, track, power houses, substations, transmission lines and overhead construction, carhouses and shops, materials and supplies, financing and accounting, publicity, timetables and schedules, conducting transportation, the problems of handling employees, etc. It is our aim to have every story published in the JOURNAL handled by someone thoroughly familiar with that particular subject. By so doing the number of mistakes or inaccurate statements is reduced to an absolute minimum. We think the JOURNAL is as accurate as it is humanly possible to make a weekly publication. At least, to make it absolutely accurate is our steadfast endeavor, and we go to great lengths to accomplish this end.

Number of Copies Printed, 6,050 **Advertising Index—Alphabetical, 52; Classified, 48, 50; Searchlight Section, 47**

Wood-Strain Insulators

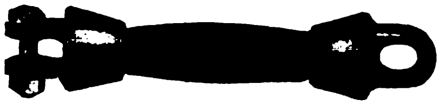
A Complete Line for Prompt Shipment

With Two Eyes in the Same Plane

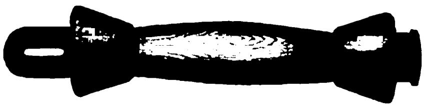


With One Eye and One Clevis Parallel

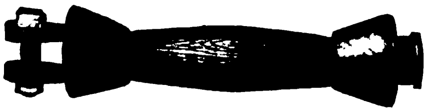
With Two Eyes at Right Angles



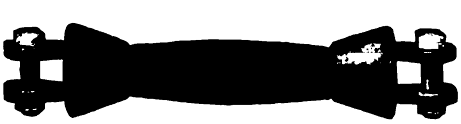
With One Eye and One Clevis at Right Angles



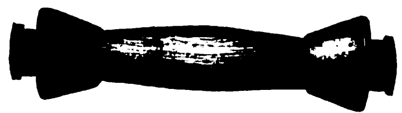
With One Eye and One Tapped Boss



With One Clevis and One Tapped Boss



With Two Clevises Parallel



With Two Tapped Bosses

A Quality Product

An important consideration in the design of wood-strain insulators is the angle at which the malleable-iron caps are swaged on. The angle must be exactly parallel to the reverse-cone seat of the insulator proper.

We have determined, conclusively, that there is only one angle, for each diameter of insulator, which gives the maximum holding power.

The eyes, clevises and tapped fittings are malleable iron sherardized, with the metal properly distributed to assure the greatest strength.

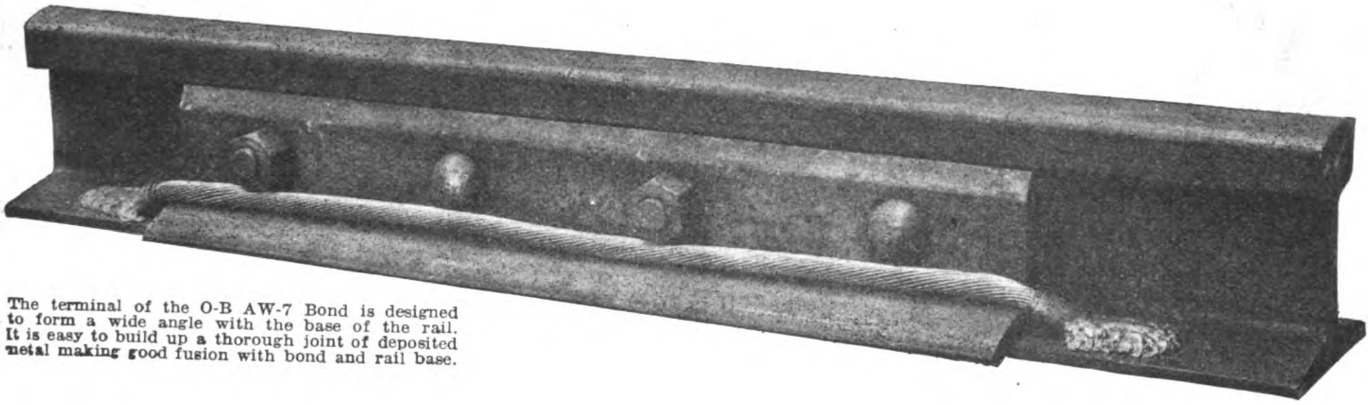
The insulator sticks are made of straight-grained, well-seasoned, air-dried, selected hickory. After being accurately turned to size, they are oil-impregnated and given two coats of transparent insulating varnish. The end castings are pressed tight on the stick, making a water-tight joint.

Every insulator is subjected to a test load before shipment.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

WESTINGHOUSE ELECTRIC

Westinghous



The terminal of the O-B AW-7 Bond is designed to form a wide angle with the base of the rail. It is easy to build up a thorough joint of deposited metal making good fusion with bond and rail base.

Make Your Bonding Easy

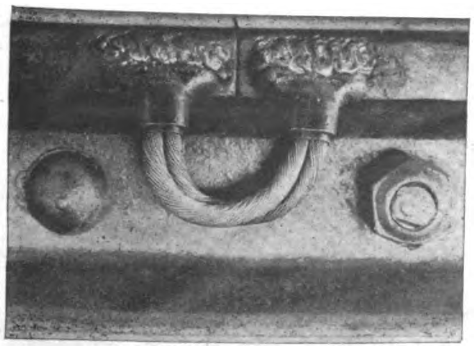
O-B Arc Weld Bonds reach you ready for application to the rail by the simplest of arc welding procedure—steel to steel with steel. The beginner makes better headway and completes better work with this combination. The experienced operator can show speed and be more positive of 100% bonding

The O-B Type AW Bonds, here illustrated as they are applied to the rail, have steel terminals. These terminals are thoroughly welded to the copper strand in our factory, where this type of welding can be accomplished under most satisfactory conditions. A copper sleeve between cable strands and steel terminal makes a cushion that protects the wires against damage from vibration where they emerge from the terminal.

The thoroughness in the O-B design is proven in the performance of the bonds.

Then there is the O-B idea of offering help and suggestion to your welding operator. A new helpful instruction sheet for the beginner or the experienced man is now available. It can be posted where the welders work or have their headquarters. Use the coupon for a copy. There is no obligation.

THE OHIO BRASS CO.
Mansfield, Ohio, U.S.A.



The AW-8 Arc Weld Bond has a similar terminal to the AW-7. The welding is easy and sure.

Use the Coupon

Free Instruction Sheet

The Ohio Brass Co.,
Mansfield, Ohio.

Please send me copy Arc Welding Instruction Sheet.

Name ....

Address ....

City ....

Not the bus

> "It is not the motor bus but the private automobile that is causing the loss of patronage to the street railways of New England."
>
> *John B. Crawford*
> *Supt. Concord (N. H.) Elec. R'ys.*

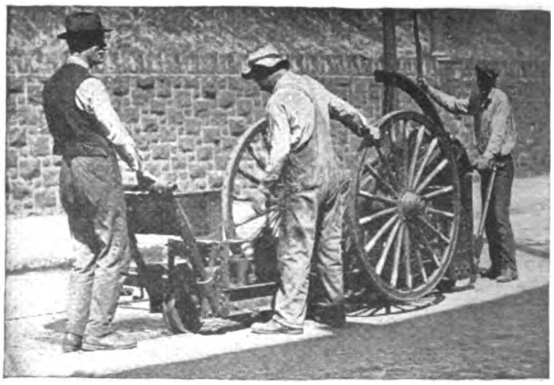
To which we venture to add that the only way to give service that will successfully compete with private automobiles is on a smooth track. Only on smooth track can service be fast, safe, comfortable, and quiet. At your right is the standard equipment for maintaining track in prime condition.

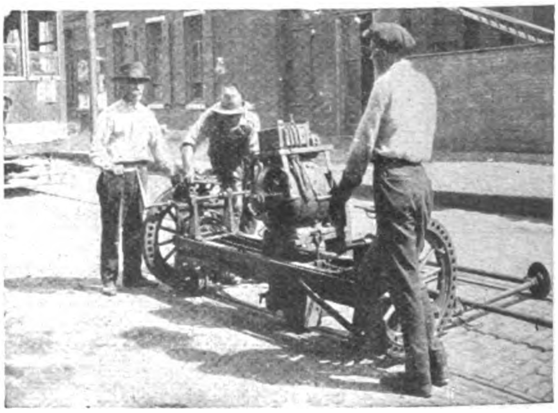
Yes, we have descriptive pamphlets

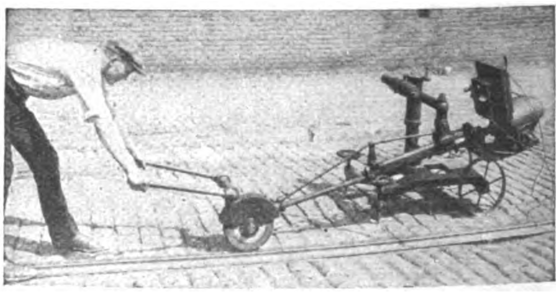
Railway Trackwork Co.

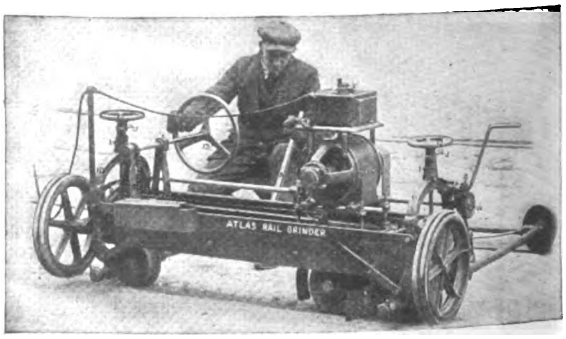
3132-48 East Thompson Street, Philadelphia

AGENTS:
Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London

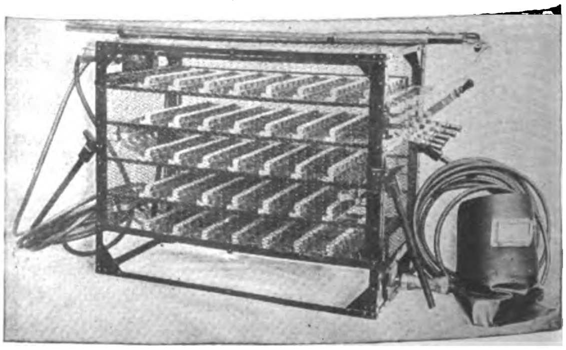

"Reciprocating" Track Grinder

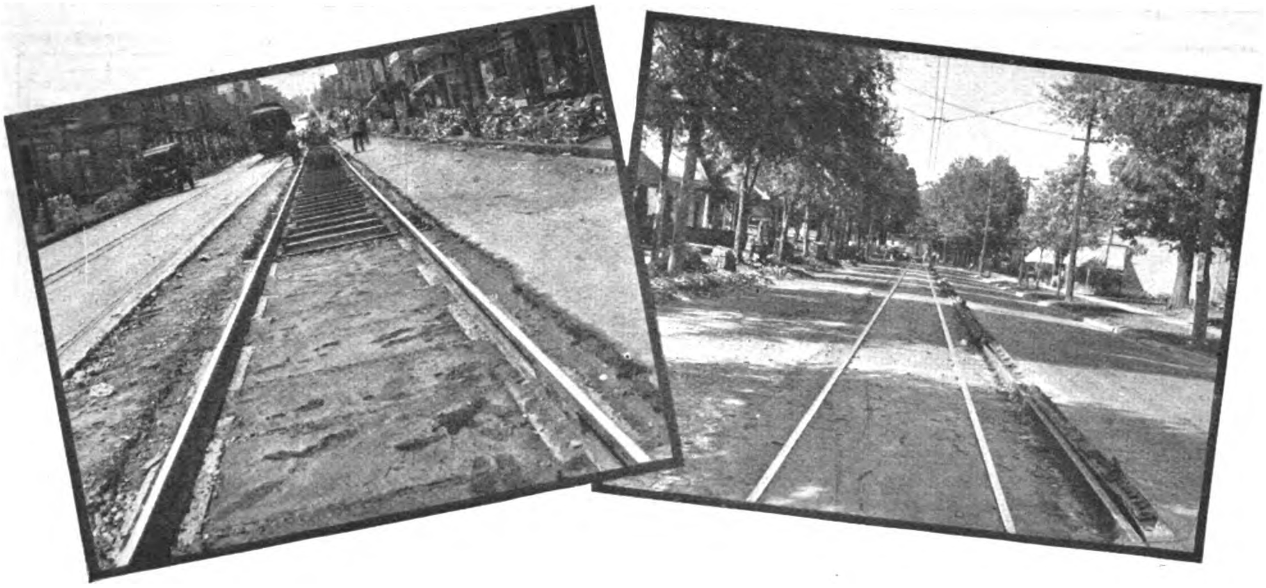

"Universal" Rotary Track Grinder

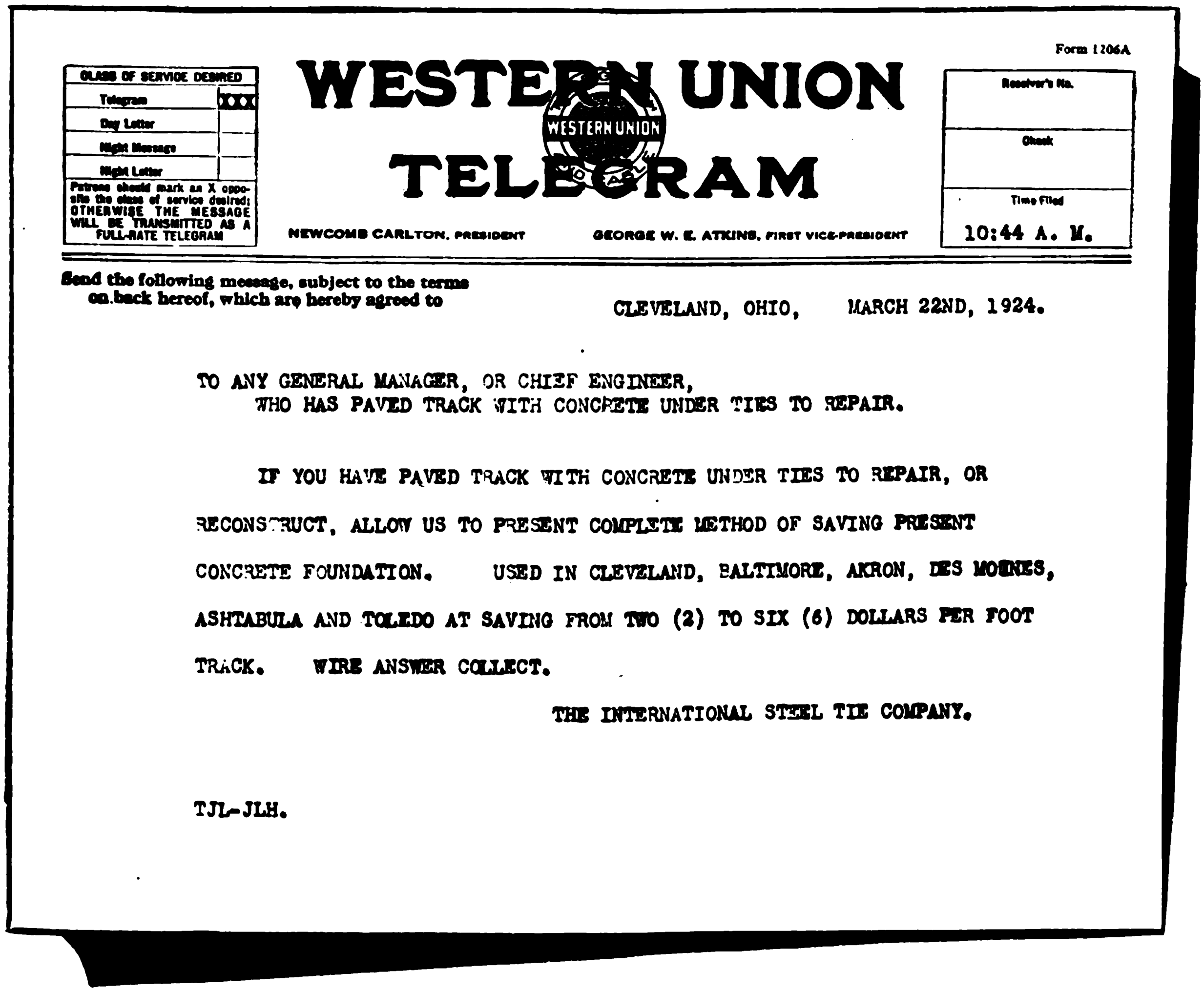

"Hercules" Rail Grinder



"Atlas" Rail Grinder


"Ajax" Electric Arc Welder





Form 1206A

CLASS OF SERVICE DESIRED	
Telegram	XXX
Day Letter	
Night Message	
Night Letter	

Patrons should mark an X opposite the class of service desired; OTHERWISE THE MESSAGE WILL BE TRANSMITTED AS A FULL-RATE TELEGRAM

WESTERN UNION TELEGRAM

NEWCOMB CARLTON, PRESIDENT GEORGE W. E. ATKINS, FIRST VICE-PRESIDENT

Receiver's No.	
Check	
Time Filed	10:44 A. M.

Send the following message, subject to the terms on back hereof, which are hereby agreed to

CLEVELAND, OHIO, MARCH 22ND, 1924.

TO ANY GENERAL MANAGER, OR CHIEF ENGINEER,
WHO HAS PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR.

IF YOU HAVE PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR, OR RECONSTRUCT, ALLOW US TO PRESENT COMPLETE METHOD OF SAVING PRESENT CONCRETE FOUNDATION. USED IN CLEVELAND, BALTIMORE, AKRON, DES MOINES, ASHTABULA AND TOLEDO AT SAVING FROM TWO (2) TO SIX (6) DOLLARS PER FOOT TRACK. WIRE ANSWER COLLECT.

THE INTERNATIONAL STEEL TIE COMPANY.

TJL-JLH.

Steel Twin Tie Track

Illinois Traction Company

Public Service Railroad
of New Jersey

Philadelphia Rapid Transit
Company

Chicago, Milwaukee &
St. Paul Railway

Washington, Baltimore &
Annapolis Electric Railroad

Kansas City, Clay County
& St. Joseph Railway

Public Confidence

IS ASSURED to Railways equipped with Union Automatic Block Signaling Systems. Return on the investment is secured by the direct and indirect savings produced.

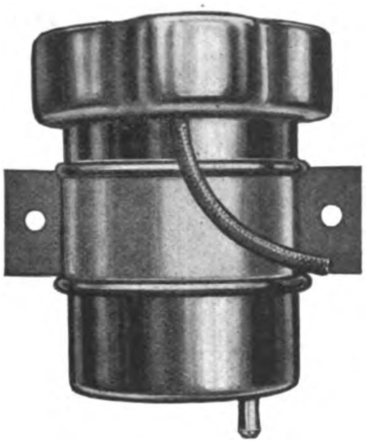
To be Complete—Safe, a signaling system must be based upon the sound principles of the Continuous Track Circuit, or in other words, a means must be provided whereby each car or train is responsible by its mere presence *anywhere* in the block or spacing section to *continuously* maintain one or more opposing stop signals in front of it as well as a stop signal behind it.

Local conditions govern each installation. Let one of our Engineers show you the benefits which Signals will produce for your Railway.

Union Switch & Signal Co.
SWISSVALE, PA.

TRADE
MARK

Just Right



The Type IC

KEYSTONE

LIGHTNING ARRESTER

This lightning arrester is small enough to be used on the most crowded pole or in any location in a car—yet—their high efficiency to insure full protection on trolley and feeder lines.

Keystone Type IC Lightning Arresters are self-contained units, wholly encased in porcelain, which have been designed to fill the demand for a porcelain-enclosed device for either car or line service.

FEATURES:

They are entirely self-contained.
Easily installed.
Small size makes them practical on crowded poles and in cars.
No inspection required.
Minimum depreciation.
Remarkably efficient.

Send for our Bulletin 197 *just off the press. It contains much information of value. Ask us to quote prices on your Spring order.*

ELECTRIC SERVICE SUPPLIES CO

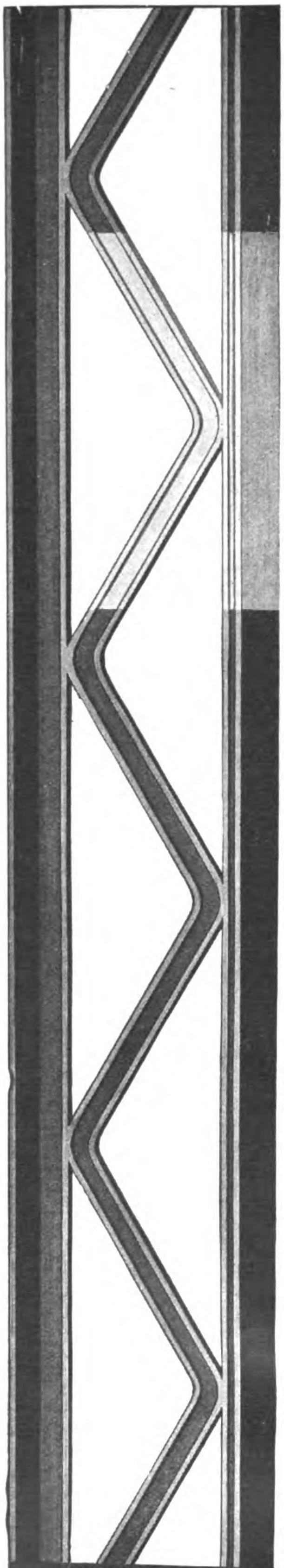
ELECTRIC SERVICE SUPPLIES CO.

PHILADELPHIA
17th and Cambria Sts.
PITTSBURGH
829 Oliver Building

NEW YORK
50 Church St.
SCRANTON
316 N. Washington Ave.

CHICAGO
Monadnock Bldg.
BOSTON
88 Broad St.

Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver



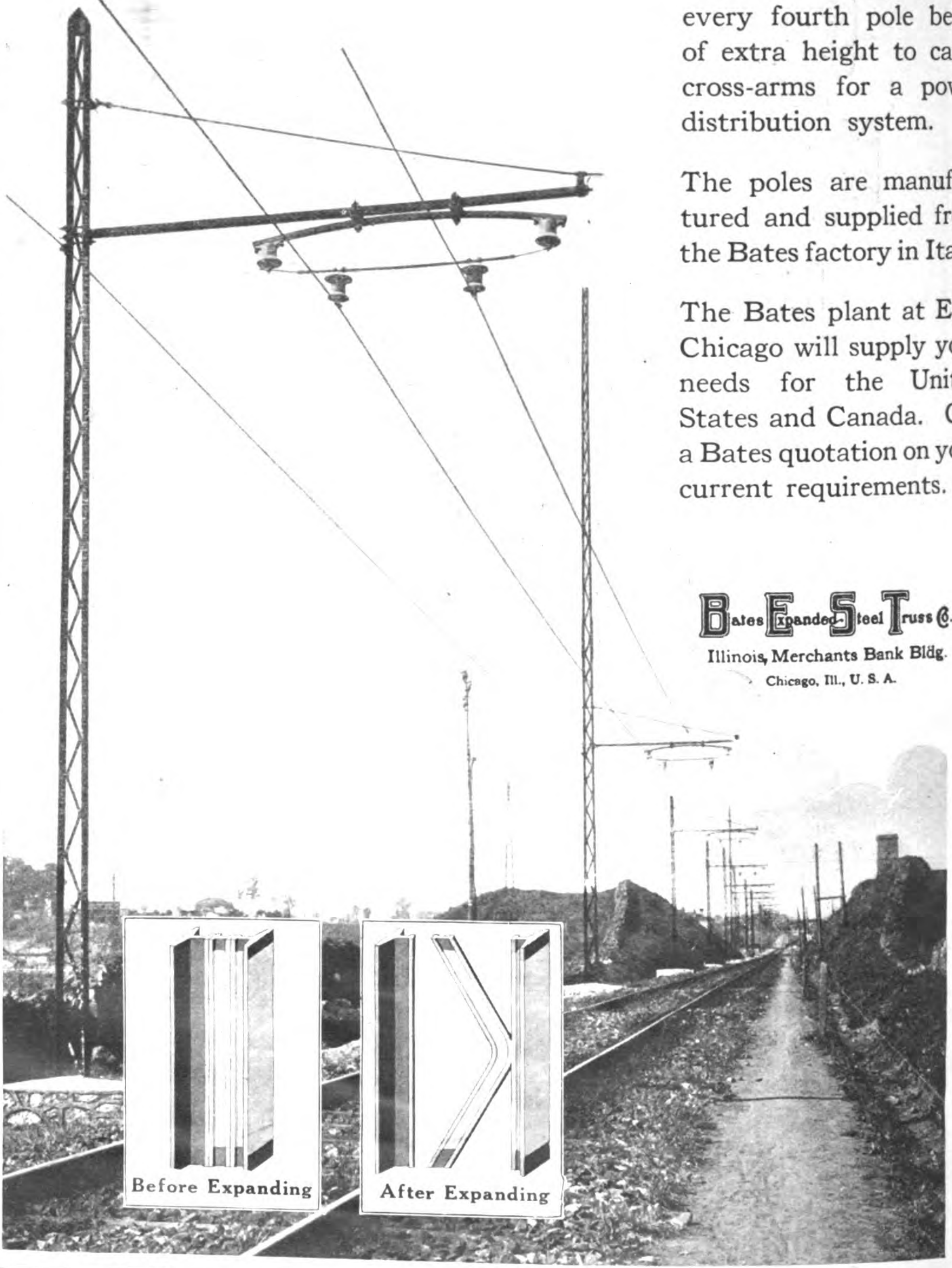
Italian State Railway Bates Pole Equipped

Splendid construction on Bates Poles is to be found throughout Italy on the Italian State Railway. An interesting installation is the one pictured, every fourth pole being of extra height to carry cross-arms for a power distribution system.

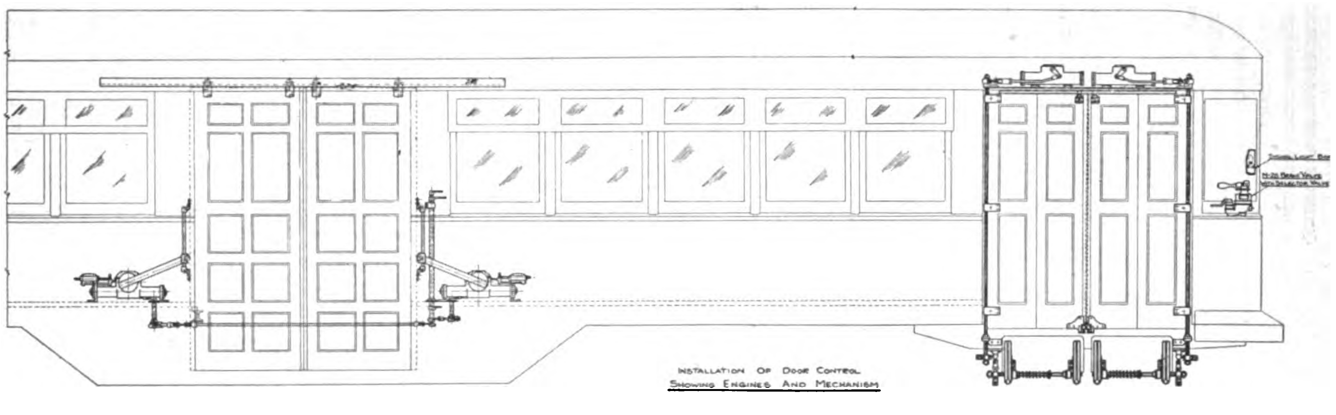
The poles are manufactured and supplied from the Bates factory in Italy.

The Bates plant at East Chicago will supply your needs for the United States and Canada. Get a Bates quotation on your current requirements.

Bates Expanded Steel Truss Co.
Illinois Merchants Bank Bldg.
Chicago, Ill., U. S. A.



BATES ONE PIECE EXPANDED STEEL POLES



Progress goes by cycles

It used to be the one-man car

Some one phase or factor of the electric railway game is always to the fore in discussion, research and general attention. The echos of the one-man car controversy are still heard in the land.

But now it's—passenger interchange

And that's the next logical step since the one-man car idea has included the larger units. Provision must be made for door control by the second man, when the car is used for two-man operation. Door-ways must be made big enough to permit the unimpeded movement of larger groups of passengers. Operation of larger doors must be made easier, and safety must be ever maintained as a feature of first importance.

National Pneumatic engineers are leading in constructive thinking and practical development along these lines.

Our experts can help you on your problem.

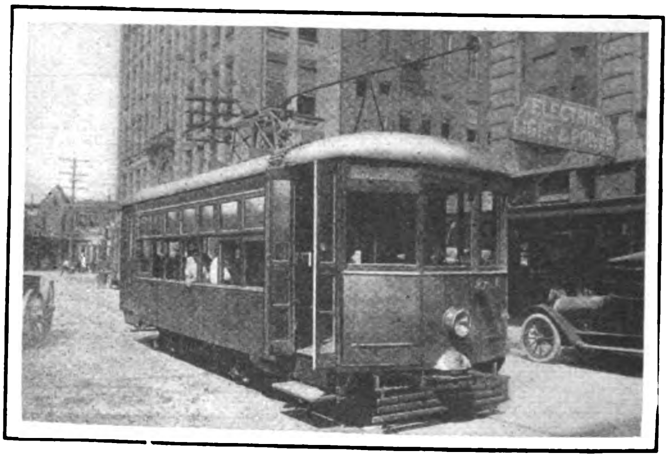
National Pneumatic Company, Inc.
Originators and Manufacturers
PRINCIPAL OFFICE: 50 Church St., NEW YORK
Philadelphia—Colonial Trust Building Chicago—McCormick Building
Works—Rahway, New Jersey
Manufactured in Canada by Dominion Wheel and Foundries, Ltd., Toronto, Ont.

DEFINITION OF A SAFETY CAR

"Any type of car equipped with *adequate* Safety Devices for one-man operation."

A. E. R. A. Committee on Safety Car Operation, 1921.

Safety Cars—

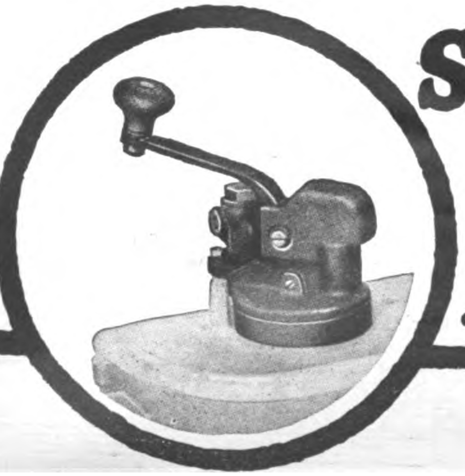


"Earn More by Saving More"

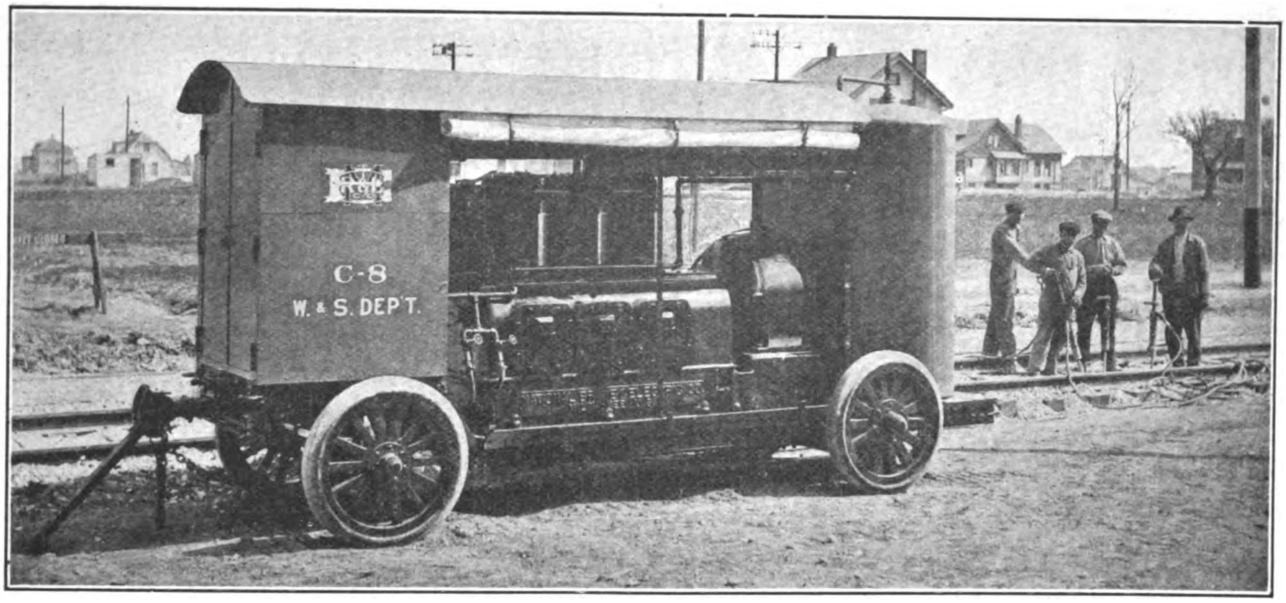
Safety Cars are notably successful because they render safe, efficient, high-class service at less expense to the railway.

They increase net earnings by reducing operating costs.

We furnish the Air Brake and Safety Car Control Equipment which **makes** the Safety Car. If you are contemplating the purchase of new cars the question of equipping them for Safety Car service should be thoroughly considered. Your old cars can also be made to show higher profits by the installation of our devices.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH



One of the Westinghouse-National Compressors used by the Milwaukee Electric Railway & Light Company.

—it's a

WESTINGHOUSE-NATIONAL

—that is sufficient recommendation for anyone who has had experience with an Air Compressor of this famous make.

We furnish models suitable for any class of way maintenance work—or for Power Plant, Car Barn and Shop installations.

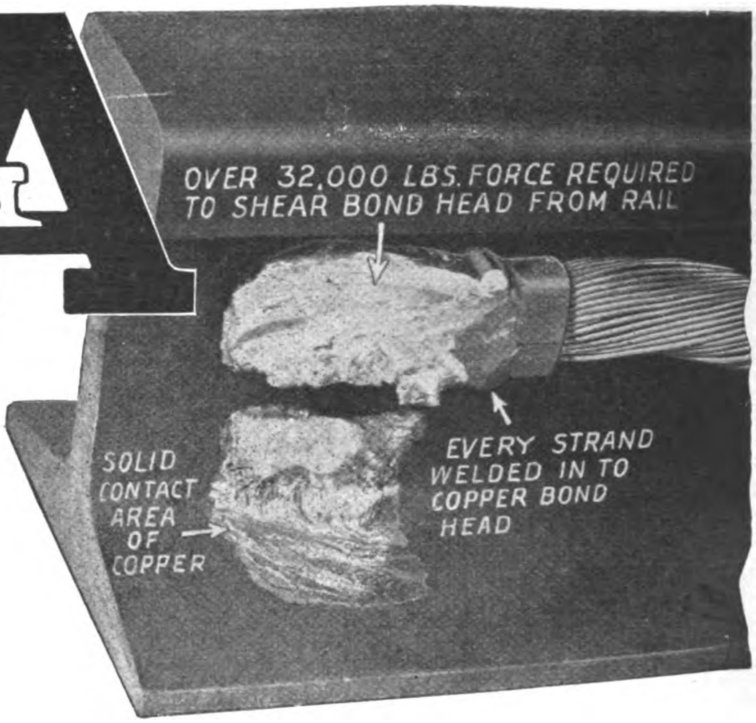
By specifying Westinghouse-National Compressors you get the advantage of the widely-discussed HP Automatic Control, which *saves power and minimizes wear.* In addition, you get a quality of design and construction throughout which assures years of steady, dependable service at extremely low maintenance cost. Performance records are the best proof. Send for Catalog today.

TRADE MARK

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

WESTINGHOUSE-NATIONAL
Air Compressors
"QUALITY MACHINES FOR QUALITY SERVICE"

UNA RAIL BONDS


OVER 32,000 LBS. FORCE REQUIRED TO SHEAR BOND HEAD FROM RAIL
SOLID CONTACT AREA OF COPPER
EVERY STRAND WELDED IN TO COPPER BOND HEAD

Photograph shows UNA Bond head removed after applying an equivalent of 32,000 lbs. direct shearing force. Note shear took place through bond head leaving the weld of copper to steel intact.

An Unbroken Path of Copper—From Rail to Rail

Rail Bonds must carry current—that's why they are made of copper—in that respect all bonds are alike.

But Bonds must be electrically connected to the rail — that's where they differ — that's the real point to think about in good bonding.

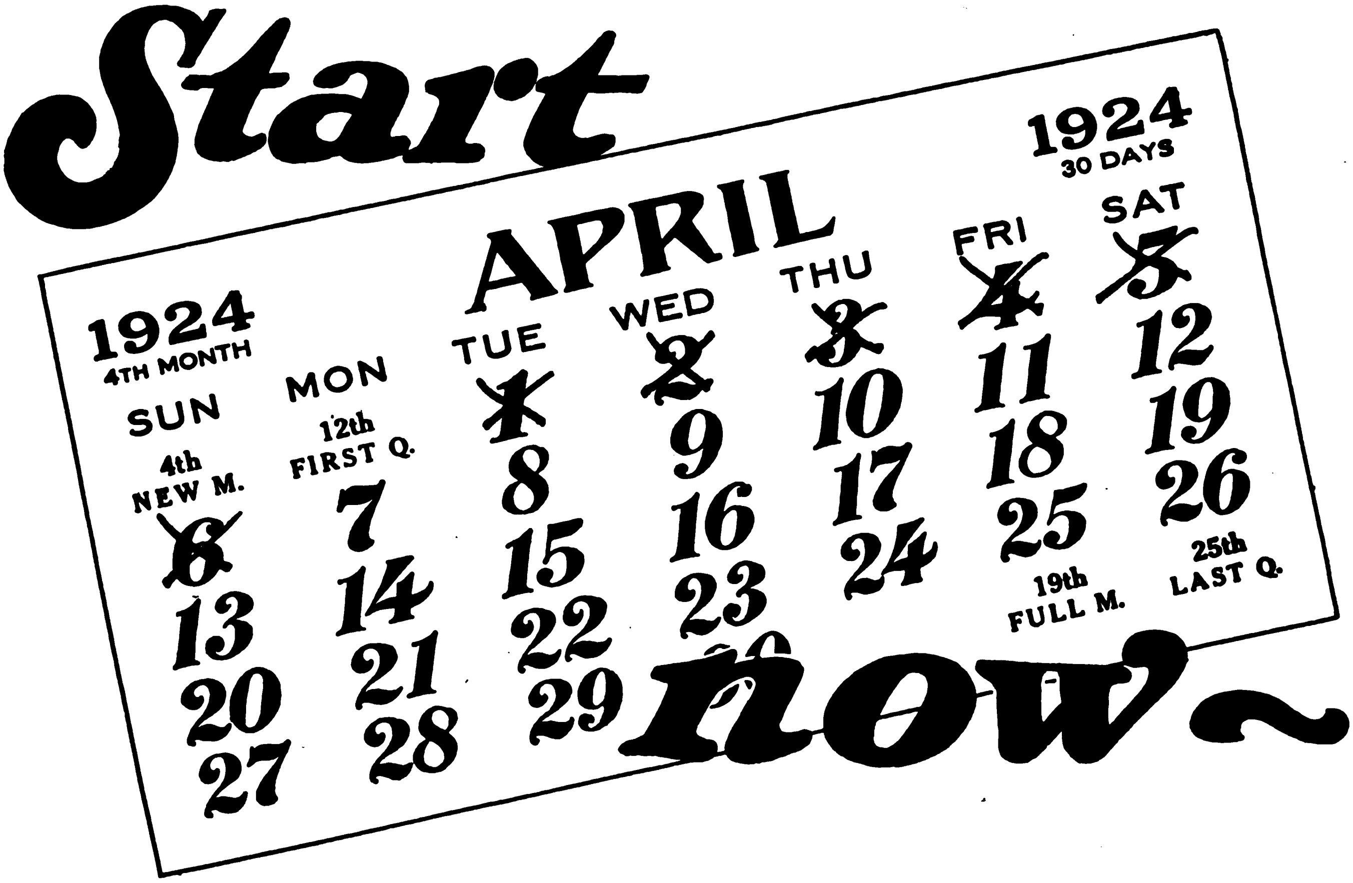
If the bond itself is copper, it's logical to weld that bond to the rail with copper. That assures the full carrying capacity of the bond with no extra resistance added to the bonds at the point of contact with the rail. That means an all-copper path from rail to rail.

That's the UNA Process of Bonding—simple and logical—35 seconds welding time applies one head of a 4/0 bond. The Bond head is held against the rail with a mold. The arc is struck—when the mold is full the bond is applied.

The weld is strong, 32,000 pounds direct pressure is necessary to shear it from the rail. Every strand carries its load because it is welded into the bond head. The area of contact of the copper weld to the rail is from 4 to 6 times the area of the bond; your factor of safety for 100 per cent bonding.

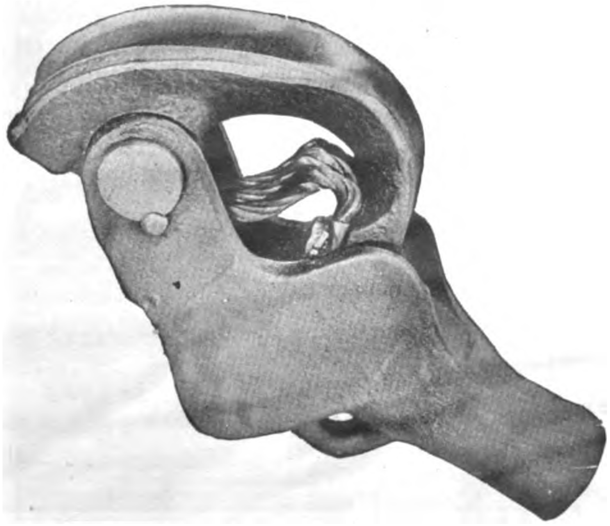
Una Rail Bonds of standard capacities are available in both laminated and cable types. Let us send you samples for your particular types of Rail Joint.

Rail Welding and Bonding Company
Cleveland, Ohio
UNA RAIL JOINTS


Start
1924
30 DAYS
APRIL
1924
4TH MONTH
SUN
MON
TUE
WED
THU
FRI
SAT
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30
4th NEW M.
12th FIRST Q.
19th FULL M.
25th LAST Q.
now~

GET the benefit of trolley shoe contact, in time for heavy summer traffic. When hot weather causes slack in the overhead, and extra cars are crowding the lines, then you'll be glad that you have eliminated jumping trolleys, broken span troubles and similar mishaps.

Numerous roads all over the country are using Miller Trolley Shoes. More join the list every year. Their testimony and records prove the efficiency and economy of sliding contact.



Immediate Delivery

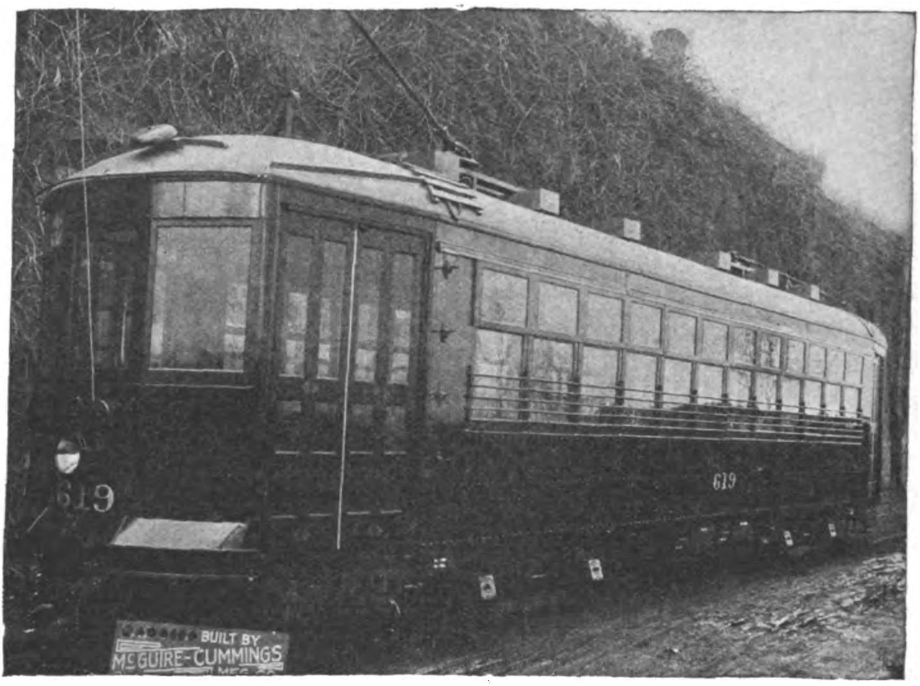
Increased production facilities have enabled us to catch up with the demand for Miller Trolley Shoes. Ample stocks now on hand. Orders shipped the day received.

Miller Trolley Shoe Co.

295 Columbia Road, Boston 21, Mass.

Western Representative:
Economy Electric Devices Co., 1590 Old Colony Bldg., Chicago, Ill.

McGuire-Cummings Manufacturing Co.



*Multiple-unit-control double-truck passenger car for two-man operation—
Built for Georgia Ry. & Power Co., Atlanta.*

The above shows type of cars built for the Georgia Railway & Power Co. of Atlanta. Succeeding advertisements will feature cars of the following types recently built by us.

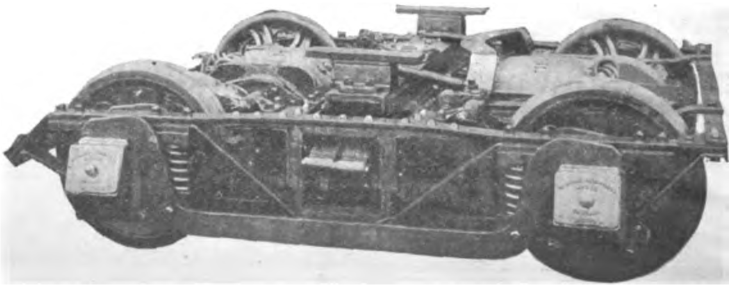
1. **Light-weight, Double-truck Cars**
   One-man-two-man operation. Built for Des Moines City Railway Co., Des Moines, Iowa.
2. **Safety Cars for One-man Operation**
   With double doors. Built for Gary Street Railway Co., Gary, Ind.
3. **Center Entrance Cars**
   (Peter Witt type.)
   Built for the City of Detroit.
4. **Light-weight Suburban Cars**
   Built for Chicago & West Towns Railway Co.

Our engineering department is at your service. We will be pleased to either submit specifications and drawings and to quote prices thereon, or we will submit proposals on specifications furnished.

McGuire-Cummings Manufacturing Co.

General Offices
111 W. Monroe St., CHICAGO, Ill.

McGuire-Cummings No. 62 motor truck for low car body for city service



Inside hung brake equalizer design, 26-inch wheels

Electric Railway Lubrication

An involuntary tribute to Galena Quality

Imitation, either of men or materials, is admittedly the most sincere compliment that can be offered. It is an acknowledgement of recognized worth. Emulation is never directed to the mediocre.

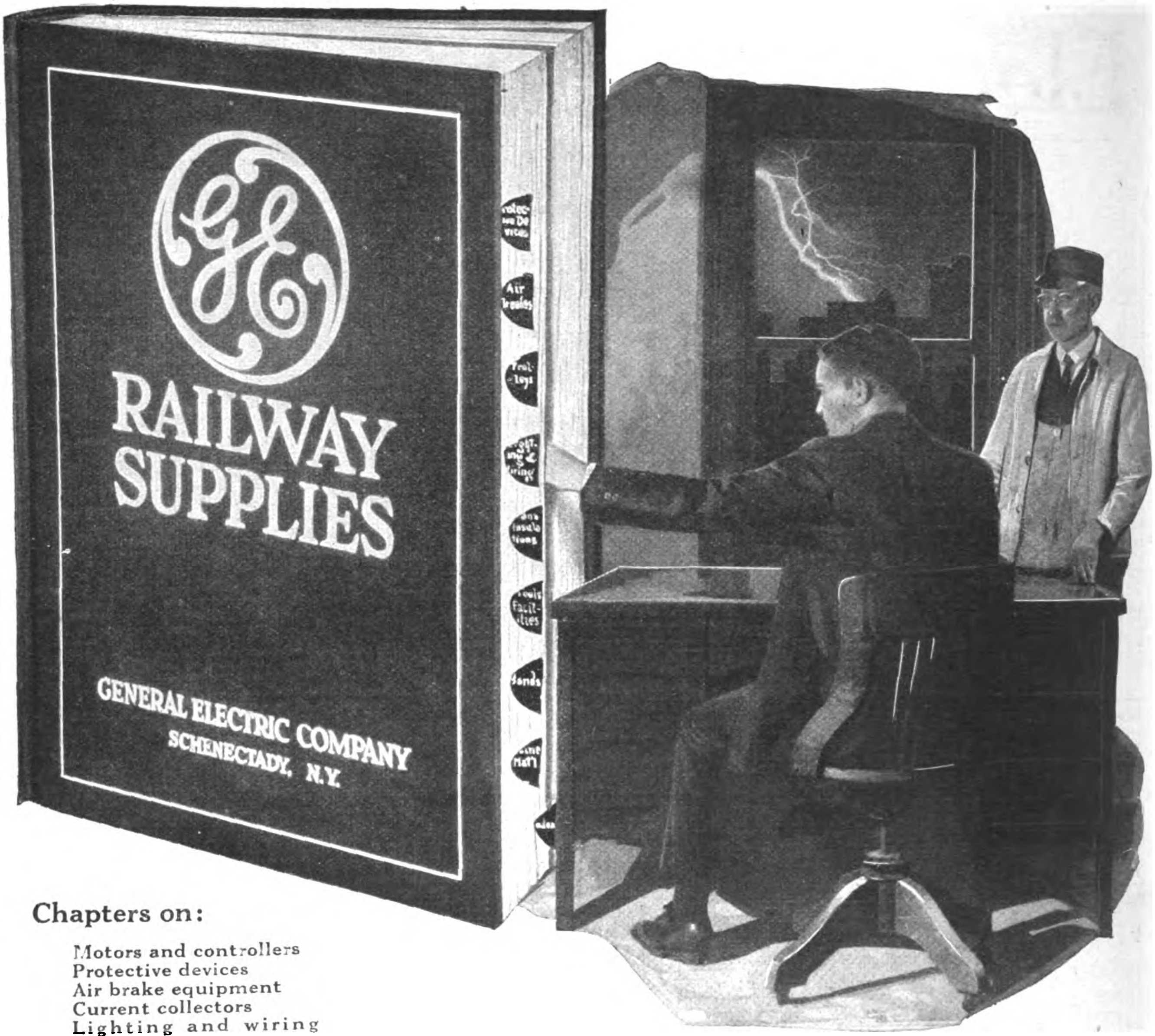
Galena Oils and Service have earned an enviable reputation in the field of railroad lubrication. They have established standards that are accepted as the basis of reliable quality and correct practice. They have received perhaps a lion's share of the fulsome tributes of attempted imitation.

"Good as Galena" is a free-flowing phrase, with marketers of railroad lubricants. Its constant repetition worked up sufficient confidence in some to stand back of the claim—for a short time—by guarantee. Then came the awakening; a short time was enough —and enough was *plenty!*

Hence "the passing of the guarantee contract." It has passed—for those who tried but failed to meet its exactions. But not for the Galena-Signal Oil Company, to whose faith in the uniform quality and efficiency of its products it owes its origin. Nor for the hundreds of railroads—steam and electric—who have found its straightforward, protective provisions a safeguard in securing dependable and unfailing service.

"The guarantee contract is the practical barrier of distinction between unsupported assertion and practical proof, of lubrication value."

Galena-Signal Oil Company
New York Franklin, Pa. Chicago
and offices in principal cities



Chapters on:

- Motors and controllers
- Protective devices
- Air brake equipment
- Current collectors
- Lighting and wiring supplies
- Electric fans
- Insulating materials
- Repair shop tools and facilities
- Overhead line material
- Rail bonds and bonding tools

Your Guide
to New and Better Standards

Another car is pulled in—motive power out of commission—inferior arresters have failed again. The engineer turns to his G-E Catalog and finds complete data on proper G-E Arresters which would have protected—and which will be installed.

Thus, the G-E Railway Supply Catalog guides electric railways in the *selection* of modern equipment—and supplies. Every road in this country has a copy; railway men regard it a great step toward more uniformly high standards.

Those, if there be any, who are not using their Catalog need only be reminded of the wealth of information it contains. Keep your copy near.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-343

GENERAL ELECTRIC

New York, April 5, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

Volume 63
Number 14

'Tis the Spirit of Terry O'Toole, We Need

WHEN Terry O'Toole discarded the bricks in Erin and brought blarney to Americky, he laid the foundation for a public-be-pleased policy which embodied loyalty, service and sacrifice rather than duplicity, indifference and compromise. There were three beneficiaries when the earthly day of reckoning came—his employer, the public and himself.

There is a lesson for trainmen everywhere in the tale of Terry O'Toole, a one-man car operator in Loteda, Ohio. He ran the car, rang up the fares, helped patrons up the step, carried the babies, later depositing them in the mothers' laps, trained the fender to scoop up bodies which were on the point of landing in the next world, ran into a burning building to save his aged father and became the owner of two shares of the traction company's stock. All this he did and even more. He won the fair daughter of the president of the railway, and that terminated his fare-collecting days.

Unfortunately, Terry O'Toole can't be located for confirmation of the story. The Loteda Traction Company never employed a motorman of that name, for the Loteda Traction and Terry O'Toole are only screen realities in "Conductor 1492," produced by Warner Brothers. But an hour watching Terry at work will probably do trainmen more good than a score of service sermons and a billion booklets on courteous conductors.

With a good start and a definite objective Terry was sure to be a success, and a smiling one, too. His getting on in the world was an accomplishment in thought long before it was a reality. Back in the old country, when his father and grandfather were fighting (not discussing) whether they would send Terry to the United States or to Americky to try his luck, the hero of the plot was dreaming of trolleys, tracks and traffic. Terry knew the secret of success was service, civility and loyalty. Then, too, Terry liked his work. He knew that one used many more muscles to frown than to smile, and he didn't believe in working overtime. Though Irish enough to have a temper all his own, he never showed it. Rather did he show up his tempters and turn the tables, but never the trolley, on them. On one occasion, when all his passengers talked at him at once, he pulled down a shade on which was written "$50 Fine for Talking to the Motorman." With equal finesse did he spurn a lift in the vice-president's seven-passenger Cadillac, declining graciously with "No, thanks, I prefer my fifty-passenger car."

The lesson of Terry has been told many times in many ways. His methods are worth trying even if the measure of success is not often so great as was Terry's, for not every president's daughter can win a motorman. But every operator of a one-man car or a conductor on a two-man car can bring credit to himself, prestige to his company and satisfaction to his public. The trainmen are the real salesmen of service, with the company backing them up. The industry has another proof of this is in Terry O'Toole.

Saginaw Benefits by Car-Bus Franchise

CO-ORDINATION of car and bus, as exemplifield by the Saginaw operation under the new franchise which brought the trolleys back after two years cessation of service, perhaps offers a solution for the transportation agitations prevalent in some of the smaller cities today. Placing the bus under the management of the railway and giving the community a voice in the operation of the combined system has satisfied the people of Saginaw and resulted in unprecedented patronage during the first three months of operation, as noted in the article on page 531.

What has taken place during the last two years in Saginaw may be taken as indicative of what will occur in other municipalities if the street railway is forced to cease operation because of competition and too low a fare. The novelty of the motor-driven vehicle and the desire to have the latest mode of transportation has led to the tendency in many cities to refuse an increase in fares to the railway, but to permit competitive bus service, even at a higher rate than that asked by the car company. The service given by the trackless routes has been by "jitneys" and individually owned buses. This was the case in Saginaw, and while there was not a true test of organized bus transportation, nevertheless the two years of suspended car operation should have been ample in which to organize and demonstrate the feasibility of the bus for a city of that size.

The difficulty in Saginaw, as well as elsewhere, was that the city administration insisted upon a rate of fare so low that no responsible bus interests would undertake the service. It made a good political issue to do this. But when the people got tired of keeping the problem in politics, the public officials not only found that they would have to permit a fare higher than 5 cents, but that they could make a better bargain with the railway company than with any one else. In fact, it was the only way they could be sure the people of Saginaw would have adequate and dependable transportation. With politics displaced by common sense, the people readily approved the franchise and are now enjoying the benefits of a modern car-bus system conducted on the most economical basis.

"Personalize"

IN THE business world in general there has been no satisfactory substitute for personal contact, and the utility business is no exception. Elimination of the popular concept of the "soulless" corporation is one of the important results which may be accomplished.

In this connection it is gratifying to note the spirit that was manifested during the recent joint meeting of the Illinois railway, gas and electric associations in Chicago. The organization of a speaker's bureau to qualify employees for carrying the facts regarding the utility business directly to the people was indeed a long step in advance, and one which, if properly applied, has far reaching possibilities.

The word "personalize" aptly defines the desired objective; personalized relations between the management and employees on the one hand, and personalized contact between the utilities and the public, on the other. Adding this thought to the phrase used by the JOURNAL to express Mr. Budd's ideas as set forth in an interview with him last December rounds out an inspiring slogan:

"Modernize, Merchandize and Personalize"

Cleveland Railway Can Do It Best

BUSES have been proposed for use in Cleveland. One set of interests appears to be demanding certain rights whether or not the Cleveland Railway is willing to go into the bus business. Another set has gone on public record as desiring rights only if the local railway is unwilling or unprepared to operate buses. As for the railway, its position is quite clear. President Stanley has said that if the city craves buses the railway should be allowed to operate them.

One thing is certain. Buses can be expected to operate in Cleveland only at a fare which will insure a profit to the operators. In fact, the proposal of the People's Motor Bus Company contains a provision for a 10-cent fare. The apparent excuse behind this request is that a parlor car service—something between that supplied by the taxicab and the street car—will be furnished, and that largely for this reason the service will not compete with that of the railway. As a theory, part of that is all right, but in the case of the Cleveland Railway, under the present service-at-cost grant, the cost in fares to patrons would be only 6 per cent on the value of the capital required to be put into the system. Thus if the Cleveland Railway operated buses at a 10-cent fare and showed a profit, the excess over 6 per cent could be turned back to benefit the street car rider. Of course, some will ask why the bus rider should pay anything toward the cost of the ride on the railway. In a combined transportation system, the same answer applies to this question as to why the rider on a profitable car line should have to help to pay the deficit on the unprofitable lines.

Entirely aside from the question of whether the bus would serve a real public need in Cleveland the position of the railway is a sound one. The Cleveland Railway has functioned uniformly well in the interest of the public. There is no good reason why it should not do so indefinitely. If Cleveland wants to have buses the best way is to turn the bus operating rights over to the Cleveland Railway as this will make certain that the city will continue to secure in full the transportation benefits which it now enjoys. The greatest benefit of the bus will unquestionably come when it is operated by the same organization as the railway, so that it can be made to extend and amplify the service of the rail lines without the competitive results, if operated separately, which injure the prospects of both systems.

Interurbans' View of Billboards

THE announcement made a few days ago by the Standard Oil Company that it intended to discontinue the practice of billboard advertising where such signs deface attractive scenery is welcome news. Other large manufacturers have agreed to do the same. While the immediate object of this plan is to render the highways more attractive to automobilists, perhaps this program of removal will eventually extend to routes of the interurban railways and steam railroads. At present the unsightly billboards lining the tracks in many places are a source of annoyance and displeasure to passengers.

Advertising is a good thing in its place, but, like many good things, it can be done in the wrong way. Every manufacturer has a story to tell the public, and his prosperity depends to some extent upon the skill used in telling it. It is doubtful, however, whether advertising on a billboard located where it mars the beauty of a picturesque spot really promotes sales. A better place to advertise is in the advertising racks of electric railway cars and in stations, making use of the attractive cards that often display real art as well as present a selling appeal. Such advertising is not a transgression upon any one's outlook. As with newspaper and magazine advertising, it comes to the reader when he is in a receptive mood to receive information, and thus serve a useful purpose. But billboard advertising along the highways and railways is displeasing to many, and it sometimes constitutes an accident hazard as it cuts off a clear view.

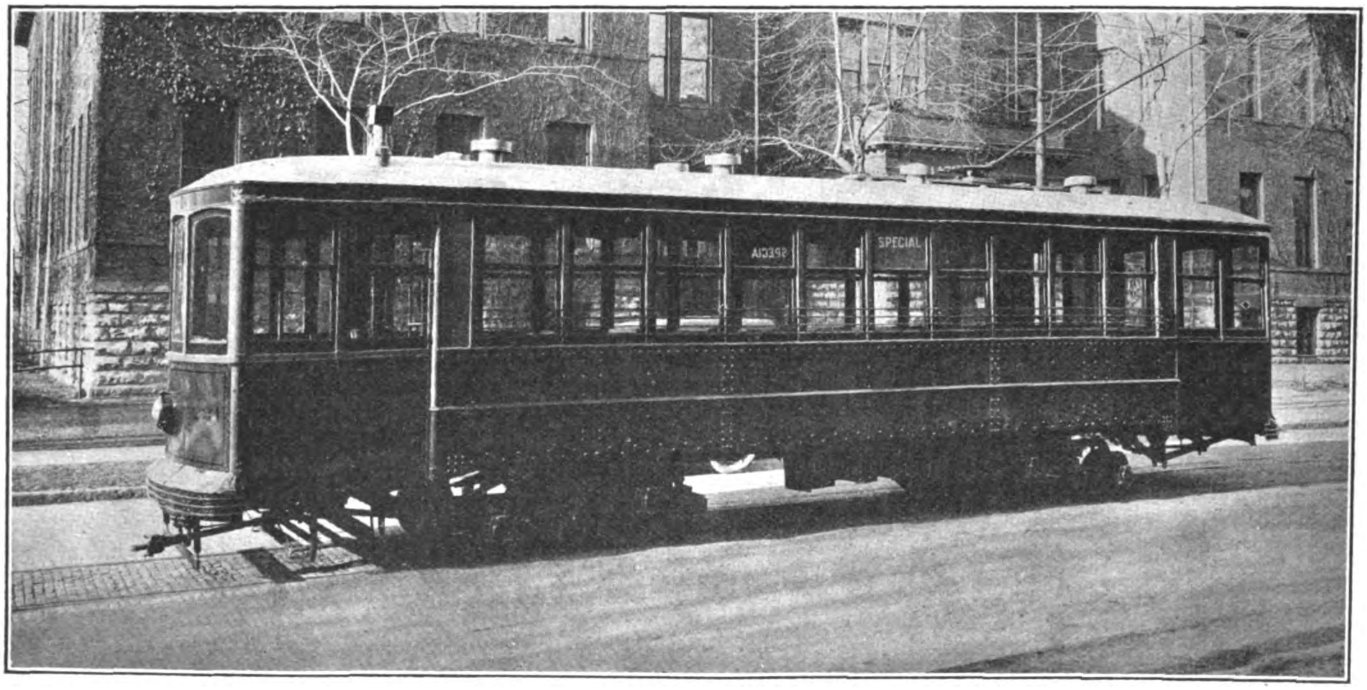
If It's Worth a Picture, Make It a Real One

THESE days the electric railway industry is making use, as never before, of window posters, cards in the advertising racks and pamphlets for distribution to passengers. To brighten up the appearance of such publicity material, many companies have introduced pictures of their cars and other equipment. In so doing, some have had the good judgment to make the pictures accurate and lifelike, while others have carelessly presented unreal objects and labeled them cars, or whatever they were intended to represent.

If it is worth while to use a picture at all in publicity work, it is worth while to make it a real picture of the desired object. It is almost always a mistake to think, "The public doesn't know anything about that. People will never notice the difference." The public has hundreds of thousands of eyes, and includes many persons trained to accurate observation. Such people at once notice any inaccuracy in the railway company's advertising. There are also a great many people who perhaps do not know why a picture impresses them unfavorably, but who somehow subconsciously recognize that it is not as it should be. It is quite worth the cost to have a professional photographer take the pictures needed for publicity matter. The railway equipment will then be shown as it really is.

How Saginaw Has Co-ordinated Railway and Bus

Unified System of Transportation Result of People's Referendum—25 Modern Buses Operate on Three Routes Specified in 15-Year Franchise—Control of System in Hands of Public—Railway Equipment Rebuilt and Painted



Double-Truck, Two-Man Car Rebuilt for One-Man Operation and Equipped with Safety Car Devices

SAGINAW—no longer the recognized "Jitneyville" of America—has emerged from an unsuccessful two-year trial of exclusive jitney operation and has set up a new system of transportation service. Street cars and modern motor buses have been co-ordinated to furnish a complete transportation system to this city of 66,000 inhabitants. Supervised by the people, financed and managed by private capital, the arrangements insure adequate service and at the same time retain the stimulus toward economy which accompanies private enterprise. Routes, equipment and organization of the new Saginaw Transit Company are specified in the new 15-year franchise which was granted by an ordinance adopted by a three to one vote of the people in June, 1923, to become effective as soon as facilities could be procured and placed in service.

It will be recalled that two years ago the Saginaw-Bay City Railway Company ceased operation following the refusal of Saginaw to grant a new franchise which included an increase in fare. "Jitneys" and buses of every type and form thereafter attempted to give the local service, while numerous efforts were made to come to a settlement with the railway and later with some responsible organization to inaugurate a dependable bus system. But no one could be found to take a 5-cent bus franchise, and when a 10-cent bus franchise was submitted to the people it was turned down.

The local transportation in the hands of small companies and individuals with little or no responsibility became so bad that certain civic organizations, notably the Chamber of Commerce, finally undertook the work of finding a solution. The object was to develop a comprehensive transportation plan that would supply the city's needs and prove attractive to an operating company. An ordinance providing for a combination railway and bus system was prepared and passed by the City Council. This was submitted to the people and approved at a special election, whereupon the newly organized Saginaw Transit Company became the grantee of the franchise and took steps to start operation.

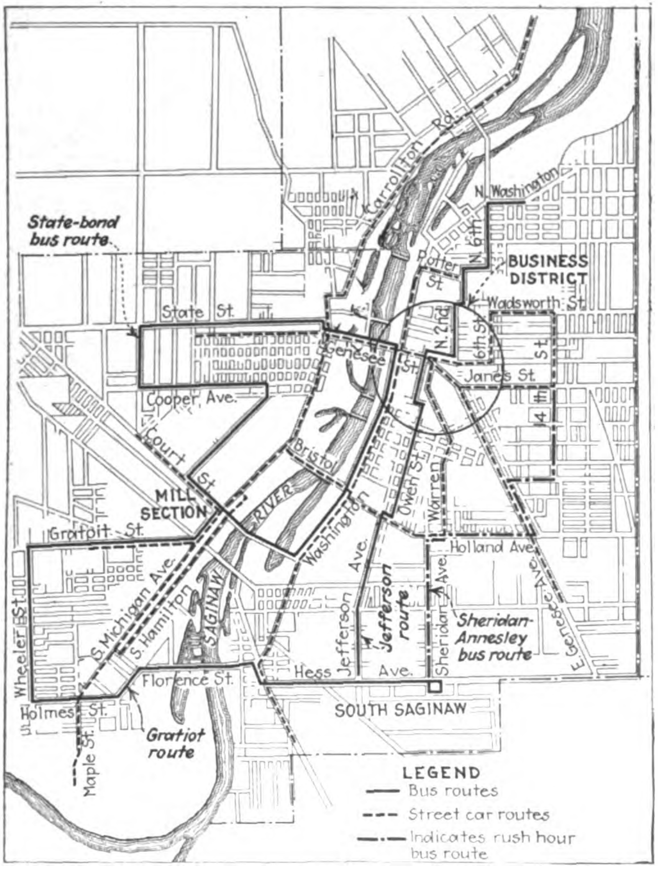
FINANCIAL STATUS

Purchase was made of the bankrupt Saginaw-Bay City Railway Company by the Commonwealth Power, Railway & Light Company in the name of the Saginaw Transit Company. The first mortgage bonds of the Saginaw-Bay City Railway Company were taken up by the new company, an equal amount at par of 5 per cent cumulative preferred stock being given in lieu thereof. The new company also took over the old underlying bonds of the former company, namely, the Saginaw Valley Traction Company, giving in return $500 worth of 5 per cent first mortgage bonds (1949) and one share of common stock for each $500 worth of old bonds. All other securities are in the hands of the holding company, with the exception of one share of preferred stock held by each of the directors of the

Saginaw Transit Company. The present distribution of securities of the Saginaw Transit Company is as follows:

	Issued and Outstanding	In Hands of Public	Securities Owned by Holding Company
First mortgage bonds, 5 per cent (1949)	$1,184,000	$564,000	$620,000
Note for car equipment	5,000	....	5,000
Preferred stock, 5 per cent (cumulative)	1,479,000	981,000	498,000
Total	$2,668,000	$1,545,000	$1,123,000
Common stock (shares of no par value)	20,000	1,137	18,863

In evidence of good faith the new company was required to deposit $400,000 in the banks of Saginaw as a fund for rehabilitation work on the cars and tracks and for the purchase of motor vehicles.



Map of Saginaw Indicates Car-Bus System Recently Placed in Operation

When the people of the city approved the car-bus franchise under which the Saginaw Transit Company is operating, they placed their approval on a system whereby two-thirds of the directorate of the company represent the public. Thus, six of the nine directors of the corporation are resident citizens approved by the Mayor and the two Circuit Judges of Saginaw County. These six, with three directors representing the security holders, have control of the management and policy of the company. All of these directors serve for fifteen years, the life of the franchise. The filling of vacancies which may occur from time to time is intrusted to the City Council in the case of the six representatives, and to the security holders in the case of the other three. The board elected C. S. Kressler as president and general manager of the company.

Before operation could be undertaken, the track, particularly the special work, had to be repaired and in places rebuilt. The old available cars, consisting of 21 Birney type safety cars, 7 double-truck converted one-man cars and 12 two-man, 40-passenger cars, were put through the overhaul and paint shop. The 12 two-man cars were rebuilt for one-man operation and equipped with safety devices. Every car was given a thorough overhaul, which included repairs and replacements to motors, trucks and bodies. "Traction" orange and "chrome" yellow exterior with black trim were used as the color combination. The orange is the predominating color, with yellow used between the belt rail and letterboard. The interiors were made equally pleasing by finishing the trim in mahogany and the ceiling in white enamel. Lettering is eliminated as far as possible and at the present time includes only an insignia below the center windows, the number on each side of the dash, and a sign stating "Please Have Fare Ready" near the door. All equipment, including the new buses, is painted in these same colors. The work of rehabilitating cars was carried out as rapidly as possible.

As operation of the railway began in November, only limited trackwork was possible. Further track rehabilitation will be undertaken in the spring.

In addition to the street car lines, all of which are about the same as before operation ceased, the company is required to operate three motor bus routes as specified in the franchise. For this service, ten White, Model 50, bus chassis with Bender, 25-passenger bodies and 15 Reo bus chassis with Fitz-John-Erwin 21-passenger bodies were purchased. As rapidly as equipment, buses and cars became available, the routes specified in the ordinance were taken over from the jitney operators. After operation on all routes had been established, the Council, acting in accordance with requirements of the ordinance, took the necessary steps to carry out the provisions restricting competition. Throughout the duration of the franchise, the Council has agreed to protect the transit company from competition.

A survey of industrial plants furnished the data which determined the location of these bus routes. On some streets these parallel the car routes. Through the business center of the city, the prospective passenger is given the choice of using a bus or a car. However, after leaving the transfer center at Washington and Genesee Streets, the bus and car take widely diverging routes, the bus covering portions of the city not served by the car.

Bus Routes Described

An example of this is indicated in the peculiar franchise route traversed by the so-called State-Bond buses, as shown on the accompanying map. It was found by checking that people living in the southeastern portion of the city traveled to business mostly in the heart of the city. Workers living in the northwestern portion of the city were largely employed in mills in the southwestern section. So a bus route laid out in the form of a triangle gave both these classes of people a more direct route than the car lines and supplied a load both outbound and inbound.

For the north and south traffic, the franchise specified a through bus route on Jefferson Avenue. This street passes through the business district and extends from the residence section on the north to the mill district on the south and is referred to as Saginaw's Fifth Avenue. The third route laid out to fulfill the requirements of the franchise is the Gratiot line, which starts at the junction with the State-Bond route and after traversing the southwestern suburban district terminates in the mill section of South Saginaw.

In addition, a rush-hour route known as the Sheridan-Annesley line was recently established to carry the workers in the mills of South Saginaw between the factories and their homes in east and southeast portions of the city. Several empty buses are waiting at the factories at quitting time to carry the workers homeward, while a like number of buses leave the northern terminal of the route on definitely scheduled time in the morning to transport the men to work. Very little transferring is done between these buses and the two or three car lines crossed en route, as the direct route of the buses serves the full needs of the riders.

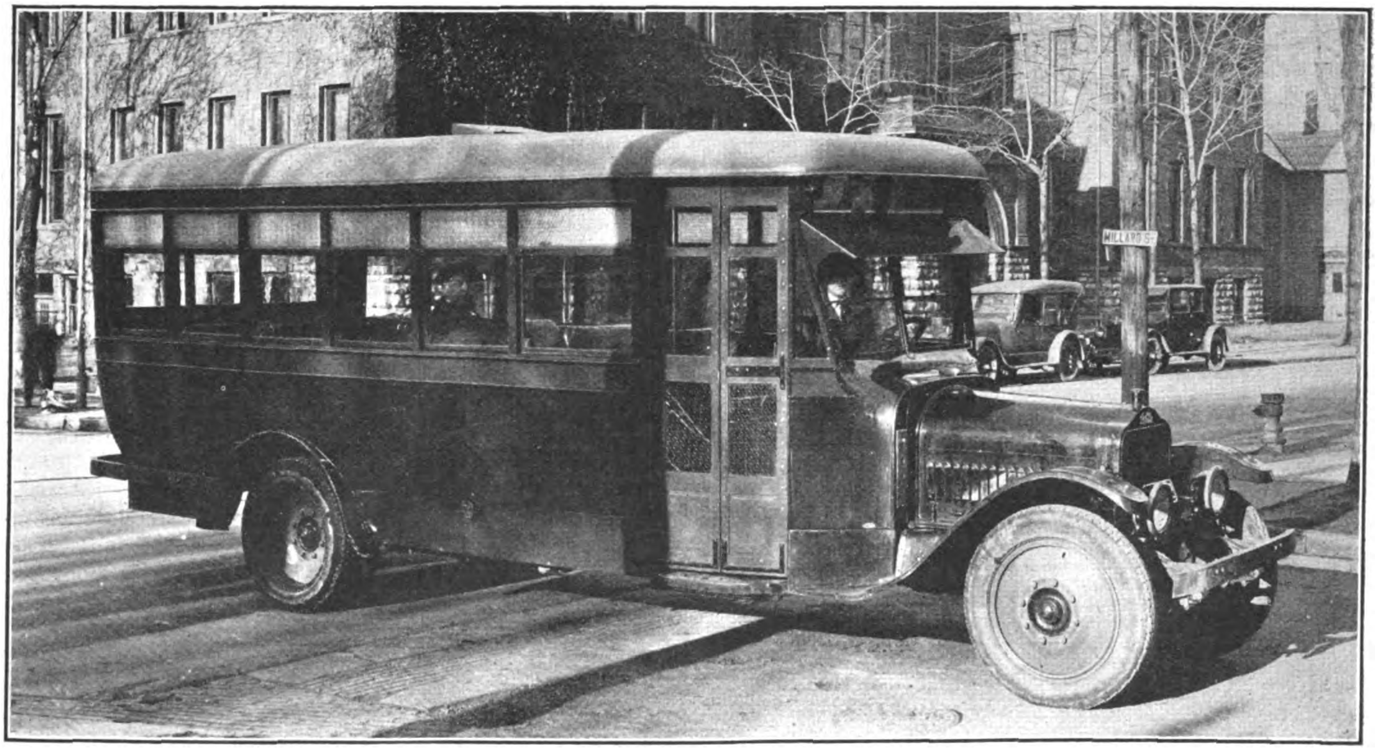
During the month of February, 1924, a total of 861,210 revenue passengers and 161,522 transfer passengers were carried by the combined system. Of this number, 577,029 revenue passengers and 102,346 transfer passengers were carried by the street cars, while 284,181 revenue passengers and 59,176 transfer passengers were carried by the buses. These figures indicate that with 16 scheduled buses during the day and 25 in the rush hours, the bus system is carrying nearly one-half as many passengers as the car system with a schedule of 26 cars during the non-rush hours and 40 in the peak hours. From this it appears that each bus is carrying about four-fifths as many revenue passengers as each street car. Standees are allowed on both systems.

Headways on both rail and bus routes vary from 6 to 10 min. during the day, and schedules have been so arranged that connections are made between buses and cars at the terminals and intersections of routes. Service has been further improved by staggering the cars and buses along the streets traversed by both. Free transfer is given between the buses and cars, and the fare of 10 cents cash or four tickets for 25 cents is the rate on both.

MAINTENANCE

Maintenance of the vehicles, both cars and buses, is done on a mileage basis. Inspection, however, is given to each piece of equipment at least once a day. In this co-ordinated system, the bus is as important a factor as the car; therefore, enough vehicles have been provided to meet the heavy rush-hour service. During the day only 16 buses are operated, leaving nine in the garage for inspection, cleaning and repairs.

Provision has been made in a section of the old carhouse for the storing and maintaining of the buses. This garage is approximately 50 ft. wide by 200 ft. long. The rails have been left in place and the floor level brought up to the face of the rail by filling in with cinders. A portion at the rear has been covered with a concrete floor and is used for inspection and repair purposes, the forward section serving as a storage area only. In an adjoining bay a wash rack has been provided where the buses are washed inside and out once a day. A battery-charging outfit occupies one corner of the garage at the rear, while a 50-ton wheel press is mounted in the opposite corner.



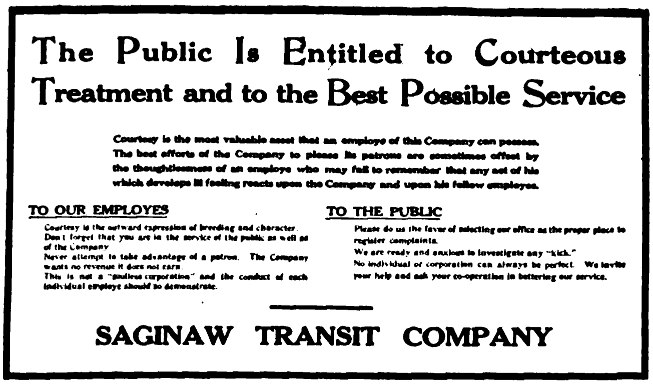
Twenty-five-Passenger, Street Car Type White Bus, Used on Car-Bus System of Saginaw

All maintenance work with the exception of tire repairs will be undertaken by the company in this garage and the railway machine shop. It was found advisable to have a local vulcanizing repair shop do all the tire work, which includes removing the tire from the wheel, vulcanizing and replacing the tire. During the three months of operation this work has amounted to approximately $40 per month. If the company had undertaken this work the cost to it would have been approximately $150 per month. An extra White and an extra Reo engine have been purchased and are kept in the storeroom, with a complete set of replacement parts for the Whites. This was not necessary with the Reos because of the adequate stock maintained by the local dealer.

When difficulty is encountered on the road by any of the buses, the driver immediately calls the garage. The garage foreman sends out the service truck and a replacement bus. The driver has been instructed to make no attempt to repair the bus he is driving, but to continue if possible to the terminal of his route, where he will take the replacement bus and continue his trip. If it is merely tire trouble, the crew on the service truck will make the change. If it is some minor mechanical defect correction is made on the road, but if the trouble is found to be serious, the vehicle is towed to the garage. In any of these three cases, the bus is returned to the garage, where it is repaired and stored until needed.

AMPLE GASOLINE CAPACITY PROVIDED

Gasoline and oil records are very accurately kept by checking the quantities used against the speedometer mileage reading. To eliminate the necessity of purchasing gasoline on the road, the gasoline carrying capacity of the buses was increased. The 25-gal. tank on the Reo cars was replaced by a 35-gal. tank, and the tank on the White buses has been augmented by an auxiliary 16-gal. tank. These capacities make it unnecessary to replenish gasoline during an entire day's run. Two 8,000-gal. storage tanks have been buried in the ground adjacent to the garage and supply the vehicles with fuel through the customary measuring pump. The oil supply is maintained in drums and is furnished to the vehicles in small quantities whenever necessary. However, a complete change of oil is made every 500 miles. Plans are being formulated for burning the old oil under the boiler used for heating the carhouse and garage.


The Public Is Entitled to Courteous Treatment and to the Best Possible Service

Courtesy is the most valuable asset that an employe of this Company can possess. The best efforts of the Company to please its patrons are sometimes offset by the thoughtlessness of an employe who may fail to remember that any act of his which develops ill feeling reacts upon the Company and upon his fellow employes.

TO OUR EMPLOYES

Courtesy is the outward expression of breeding and character.
Don't forget that you are in the service of the public as well as of the Company.
Never attempt to take advantage of a patron. The Company wants no revenue it does not earn.
This is not a "soulless corporation" and the conduct of each individual employe should so demonstrate.

TO THE PUBLIC

Please do us the favor of selecting our office as the proper place to register complaints.
We are ready and anxious to investigate any "kick."
No individual or corporation can always be perfect. We invite your help and ask your co-operation in bettering our service.

SAGINAW TRANSIT COMPANY

Sample Window Poster Being Used in Cars and Buses to Set Forth Policies of New Company

Before starting on his run, each operator is supplied with $10 worth of tokens. He furnishes his own change. All fares are collected by means of a Johnson fare box. An operator's trip sheet is used to record the fare box readings, a space is provided for the opening and closing numbers, and settlement is made to the cashier on the basis of these readings. The register readings on the trip sheet are checked in the general office by means of a statement of register readings taken by a barn man during the time the vehicles are in the barns. This reading is entirely separate and independent of the readings taken by the car and bus operators.

The classification for bus accounting, tentatively adopted by the American Electric Railway Accountants' Association, is used. For the first three months of operation, the figures showed the operating expense to be 14½ cents per revenue bus-mile, exclusive of taxes, interest and depreciation. Depreciation on the buses has been figured at 33⅓ per cent, which makes the total life of the bus approximate 250,000 miles.

Keeping the public sold on its own transportation system has been the aim of the management in speeches given before local business organizations at noon-day luncheons. "Leave your car home" is the theme of these talks and of the advertisements run in the local papers. It is pointed out to the local merchant and business man that they are losing money on the space at the curb in front of their establishments if such space is used for parking purposes. Formerly, less than 25 per cent of the merchants left their cars home, but now more than 45 per cent do so, and in that way provide a convenient loading zone for their customers. Interesting figures from local retail merchants show an increase of 20 per cent in sales, while those who are located near the transfer corner report an increase in sales of 30 per cent since the movement was started.

Parking has been changed from a position of 45 deg. to the curb to a parallel position, and time limits have been strictly enforced. All streets upon which routes of the traction company operate have been made "stop streets." This has done much to eliminate collisions between private automobiles and the cars and buses of the company.

Concrete Poles Used Because of Ornamental Appearance

Although More Costly than Steel or Wood Poles, They Are Used by the Municipal Railway of San Francisco Because They Are More Sightly and Permanent

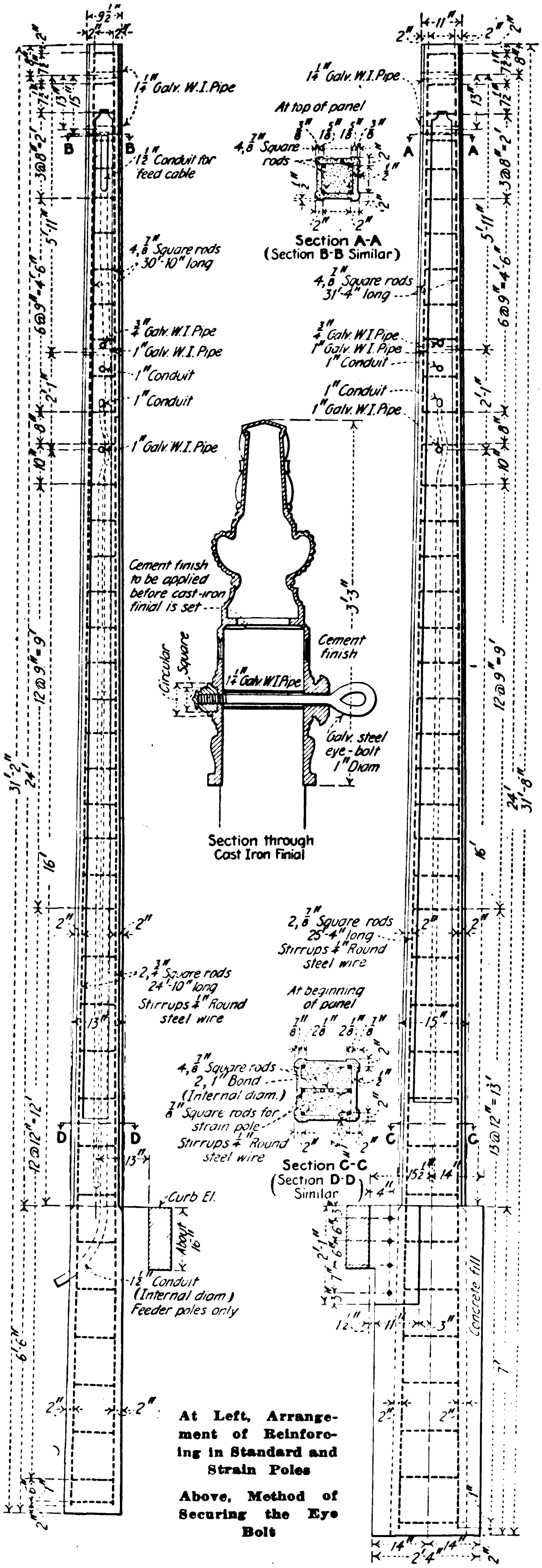
FOR a number of years the Municipal Railway of San Francisco has been using concrete poles to support its overhead construction. Various types have been tried, and although concrete poles are more expensive than steel poles in first cost they are favored by the railway on account of their ornamental appearance and because they require comparatively little maintenance once they are installed.

Forms for the poles are built as a series of horizontal troughs in which the poles are cast. The top surface is given a float finish. The poles are then covered with wet sand and are sprinkled with water every day. Wooden forms are very thoroughly wetted, particularly in the case of panel poles, so that the swelling of the wood will not crack off the corners of the pole along the edge of the panel. After the poles have been erected and finished, all exposed surfaces are painted with two coats of "Concreto" as manufactured by the Muralo Company, or some other equivalent concrete paint, of whatever color may be desired.

A concrete mixture in the proportions of 1-2-4 is used. The cement is carefully tested. At least 92 per cent by weight must pass through a sieve of 10,000 meshes to the square inch, and at least 77 per cent must pass through a sieve 40,000 meshes to the square inch.

Briquettes made from neat cement, after being kept one day in moist air and the remainder of the time in water, must develop a tensile strength per square inch as follows: After seven days 500 lb. and after twenty-eight days 600 lb. Briquettes made with one part cement and three parts sand and exposed in the same way in the neat tests must develop a strength of 200 lb. after seven days, and 300 lb. after twenty-eight days.

Pats of neat cement about 3 in. in diameter and ½ in. thick at the center, tapering to a thin edge, being kept in moist air at normal temperature for twenty-

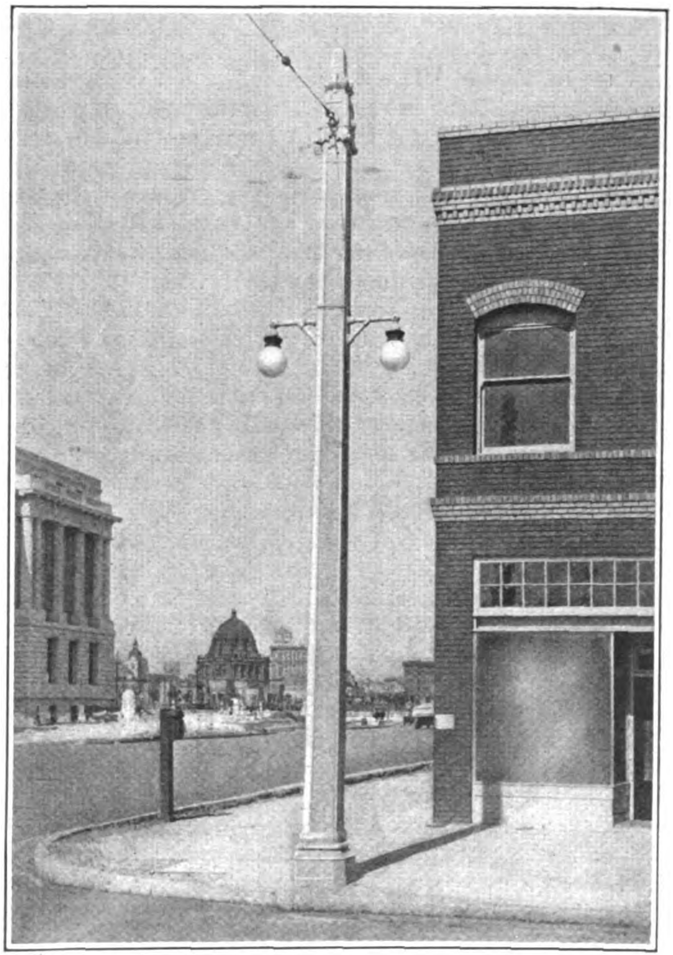

1¼" Galv. W.I. Pipe
1½" Conduit for feed cable
4, ⅞" Square rods 30'-10" long
¾" Galv. W.I. Pipe
1" Galv. W.I. Pipe
1" Conduit
1" Conduit
1" Galv. W.I. Pipe
At top of panel
4, ⅞" Square rods
Section A-A
(Section B-B Similar)
4, ⅞" Square rods 31'-4" long
Cement finish to be applied before cast-iron finial is set
Cement finish
Circular
Square
1¼" Galv. W.I. Pipe
Galv. steel eye-bolt 1" Diam
Section through Cast Iron Finial
2, ⅞" Square rods 25'-4" long
Stirrups ¼" Round steel wire
2, ¾" Square rods 24'-10" long
Stirrups ¼" Round steel wire
At beginning of panel
4, ⅞" Square rods
2, 1" Bond (Internal diam.)
⅞" Square rods for strain pole
Stirrups ¼" Round steel wire
Section C-C
(Section D-D Similar)
Curb El.
About 16"
1½" Conduit (Internal diam.) Feeder poles only
Concrete fill
31'-2"
24'
31'-8"
16'
6'-6"
7'
2'-4"
A
B
C
D

At Left, Arrangement of Reinforcing in Standard and Strain Poles

Above, Method of Securing the Eye Bolt

four hours and then placed in water and raised to a temperature of 212 deg. F. in one hour and maintained at such temperature for five hours, and other pats kept, one in the open air and one in water, at a temperature of about 65 deg. F. for twenty-eight days must show no signs of distortion, blotching, cracking or disintegration.

Poles are erected by means of a movable derrick with sling. No special tests have been made of their strength, but those in service are satisfactorily carrying a load of 800 lb. at the eyebolt. Besides sustaining their legitimate load, concrete poles have stood up well in many automobile collisions. However, these poles are very heavy, weighing approximately 150 lb. per cubic foot and the railway has found that great care must be exercised in placing them in order to avoid setting up excessive stresses before they reach an upright position.



Type of Concrete Pole Used by Municipal Railway of San Francisco

To increase the ornamental effect created by the concrete poles, a cast iron base is used. This was originally cast in one piece and was slipped over the top of the pole at the time of erection. Later, however, in order to facilitate the replacement of broken castings, these bases were made in two parts and bolted together. An ornate lighting fixture is placed on the upper part as these poles serve a combination purpose. In the accompanying illustration of a pole on Van Ness Avenue a temporary lighting fixture has been installed. Cast iron lamp brackets of a more elaborate design will eventually replace this temporary system. In 1918 the contract price for poles used by the Municipal Railway was $92 each for the standard poles and $110 each for the strain poles.

Twin City Starts Thrift Fund

Rapid Transit Company's Plan for Encouraging Savings Nearing Completion of First Year —Men Get Increased Life Insurance Besides 4½ per Cent Interest

TO ENCOURAGE its employees to save money, the Twin City Rapid Transit Company on April 1, 1923, introduced a thrift plan, and offered to give a life insurance policy to each employee who would begin and continue saving a part of his wages according to the plan. The amount of the life insurance policy thus offered varies with the length of service of the employee and his period of saving. Insurance policies in the sum of $500 are taken out by the company for all of its employees who have been in the service for six months or longer. This amount of policy is increased to $1,000 during the first year of saving to all employees who join the thrift fund and have been with the company for five years or less. It is increased to $1,100 if the employee has been with the company for six years, and to higher amounts by gradations up to the maximum of $2,000 for the man who has twenty years of service when he entered the thrift fund.

There is also a gradual increase in the amount of the principal of policy (up to the maximum of $2,000) with the length of time that the employee continues in the thrift plan. Thus, the man with one year or less of service in the company must continue his saving for five years to increase his policy from $1,000 to $1,100. Then it grows by $100 each year until the maximum of $2,000 is reached. The older man gains this maximum sooner. Thus, the man with ten years service reaches the $2,000 mark after only five years of savings, and the eighteen-year man after only three years of savings. The insurance is in addition to the death benefits.

The amount of saving required under the plan is 2 per cent of the wages of the employee, this amount to be deducted from the portion of his wages payable on the 25th of each month. The deduction from his wages for his dues in the benevolent association is made from the portion of his wages payable on the 10th of the month. The amounts for the savings fund thus obtained are deposited in one of the strongest local banks and draw interest at 4½ per cent, compounded semi-annually.

If any portion of the principal or interest is withdrawn by the employee during the first five years (except under conditions described below) his insurance automatically drops to $500, but after the fifth year his insurance policy remains at the point at which it reached when the deposits were withdrawn. Employees of sixteen years of service and more have to continue their savings for only one year to secure the same benefits. Employees placed on the pension roll are exempted from obligations to make future savings and may withdraw their savings without decreasing the face value of their policies. Exemption is also allowed to those who desire to apply their savings to the purchase of homes, as they may withdraw their deposits for that purpose without forfeiting any of their insurance. The case of special emergencies is taken care of by allowing an employee at any time to borrow from the company up to 90 per cent of the amount of his deposit, but he must pay 5 per cent on the loan, and it must be repaid in ten months after being contracted by deductions semi-monthly from the employees' wages. The purpose of charging ½ per cent more interest than that paid by the bank is to discourage applications for loans on the basis of the deposits.

Employees who leave the service have the privilege of leaving their deposits in the same bank, but in that case they will draw only 4 per cent instead of 4½. Employees leaving the service also have the privilege of continuing their life insurance policies without medical examination for the same amounts in any of the forms of policy customarily issued by the insurance company, except term insurance, and thereafter pay the premiums direct to the insurance company determined by the age at the time of leaving the service, but application to do so must be made within a certain time. In this way it is impossible for the employee to lose his life insurance after leaving the service because of inability to pass the examination. Various provisions are contained in the thrift plan to cover conditions of sickness, etc.

The plan has met popular approval on the part of the employees, and the aggregate savings under it from April 1, 1923, up to the middle of February, 1924, amounted to about $115,000.

The Car Riders Make the Pay Check Possible

A PUBLICITY slip distributed by the Olean, Bradford & Salamanca Railway, Olean, N. Y., was described in ELECTRIC RAILWAY JOURNAL for March 22, page 472. These slips are attached to all outgoing checks and are used to supplement a publicity campaign in the local newspapers. A line of type was omitted in the story referred to and the wording of these slips was on that account improperly given. The slip itself is reproduced below:

> *It Is the People*
> *Who Ride on Our Cars That Make*
> *This Check Possible*

Red Call Lights Summon Inspectors

THE dispatcher at the carhouse of the Holyoke Street Railway keeps in close touch with his inspectors on the road by means of a system of call lights. Nine red electric lights are located at strategic points along the lines of the railway. To correspond with these there are also nine lights on the wall of the dispatcher's office and nine snap switches close at hand. By a turn of the wrist he lights simultaneously one of the lights on his office wall and a light located on a pole out on the system.

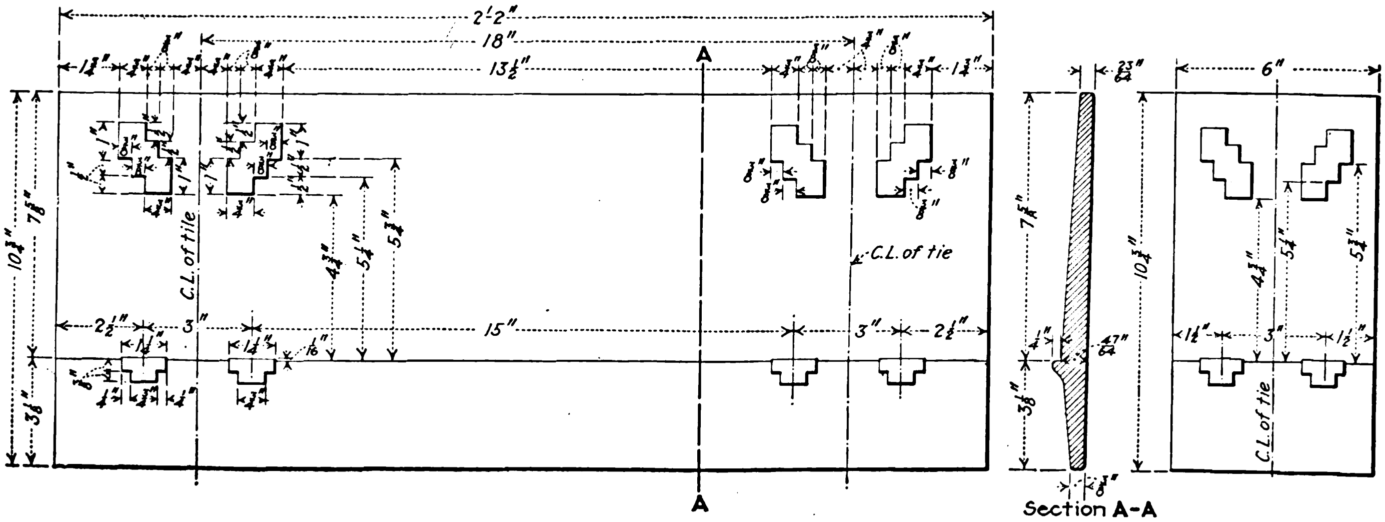
On the same pole as the red light there is also a telephone communicating with the dispatcher's office. As soon as any inspector sees the red light he immediately calls up the dispatcher. The particular advantage of this scheme lies in the fact that the red light can be seen for a much greater distance than the ringing of a telephone bell could be heard. As soon as an answer has been received from the point with which the dispatcher wishes to communicate he turns off the light again. In case no inspector answers the telephone and the red light continues to burn the car crews are instructed to telephone in before passing the point. This system enables the Holyoke Street Railway to reroute its cars in an emergency and delays have been avoided.

Rail Welding in Connecticut

An Especially Interesting Feature of the Connecticut Company's Track Is the Tilted Joint Plate and Base Plate, Adapted to Twenty-three Different Rail Sections—Precautions Adopted to Secure Good Welds

ALTHOUGH rail welding with the electric arc has been practiced on a commercial scale for more than a decade, it is only within the last few years that the subject has received the intensive study which it deserves. As it was a comparatively new field of endeavor, a great deal of individual experience had to be gained before those interested in rail welding could meet and discuss intelligently its problems. But out of the methods adopted and the results secured during the first years and through the war period, the principles of rail welding may now be regarded as more or less established.

The experience of the Connecticut Company in electric arc welding has undoubtedly been that of hundreds of others. Commencing in 1914 with the resistance type of arc welder using metal electrodes, the work was confined to the surface welding of cupped rail joints. During the war the delivery of rail was curtailed. This condition required the purchase of additional welders to maintain track, and for the most part these welders were of the motor-generator type and capable of using both metal and carbon electrodes.



Standard Base Plate, on Left, and Tie Plate, on Right, Used Under Tee Rail by the Connecticut Company. These Plates Fit a Large Number of Rail Sections

The first carbon welding by the Connecticut Company was done on joint splices in old rail, which had to be left in place when the street was paved. Obviously the combination of old rail, high carbon rolled plates, new welding machines and methods with which the operators were unaccustomed could hardly be expected to give a very high-class product. Nevertheless, much creditable work was done at this time, and the object of "tiding over" the war period was attained. With the resumption of easy deliveries of rail after the war, the use of the arc weld for rail joints received added impetus.

For many years the Connecticut Company has standardized for new work on three rail sections for its 805 miles of track owned and operated, and its 33 miles of track in and around carhouses. These standards are: The A.E.R.A. standard 5-in. 80-lb. A.S.C.E. tee, the 6-in. 100-lb. A.R.A. type "A" tee, and the A.E.R.A. 9-in. 134-lb. grooved girder. In the old track of the company, however, there are still to be found many varieties of rail sections, amounting to 150 in number. An account will be given of some of the improvements in the carbon arc welded rail joints adopted by the Connecticut Company, which it is thought will prove of interest.

JOINT PLATES AND BASE PLATES

For the old rolled joint plates, there have been substituted machined plates with a lower carbon content. This change has resulted not only in a vastly improved fit between the plate and rail, but in greatly improving the conditions for joint welding. This change was a big step in the improvement of the joint and weld.

The adoption at each joint in tee rail construction, of which the company has a large amount in paved street, of the base plate illustrated in the first drawing has also proved a definite step in increasing the strength of joint. The base of the rail in paved construction is seam-welded to this base plate. The tilted feature, which cants the rail inward to an inclination of 1 in 20, to increase the area of wheel contact on the rail and transmit the load symmetrically and directly over the center line of the web has been followed on the Connecticut company's lines for some years. Between joints the inclination of the rail is carried through by the use of intermediate tie plates of the same cross-section as the joint base plate, as shown in the drawing on this page. A feature of each of these plates is the staggered notching of the spike holes. This permits these plates to be used with twenty-three different rail sections, and the arrangement of the holes obviate the necessity for rights and lefts being kept in stock.

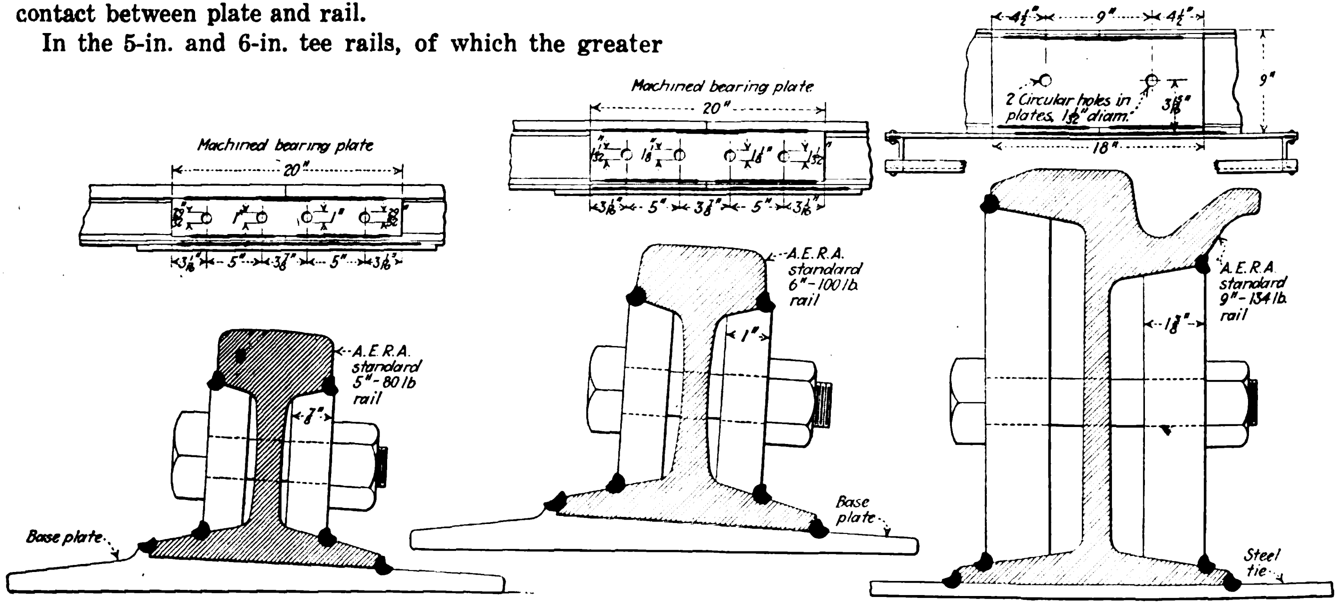
In the case of the 9-in. grooved rail, laid on steel ties, the steel tie becomes the base plate, and the rail is welded to it in the same way as to the base plate, just described. As the steel tie is also welded to the opposite rail, the track is cross-bonded, rail to rail, at every joint, thus greatly improving the track return.

BOLTS IN GIRDER JOINT REDUCED TO TWO

In the 9-in. girder section illustrated, the number of holes required by the old bolted channel bars was twelve, in addition to four holes necessary for two concealed bonds. This made sixteen holes in all in each joint. In the new joint one hole in each rail has been found sufficient, provided two high-tension bolts are used and if the plate is of sufficient stiffness to overcome any chance of bending.

The welded seam furnishes the bond. In this big reduction in the number of holes, it is felt that another great improvement in the strength of the rail end has been made. The increased thickness of the plate provides a welding shelf for the top seam and also admits of a shorter plate without any reduction in the area in contact between plate and rail.

In the 5-in. and 6-in. tee rails, of which the greater mileage will be constructed, the company's standard joint drilling has been retained to permit the use of this type of joint in existing track if necessary. The size and shape of the holes in the plates, however, have been changed. The old slotted hole inherited from steam road practice, while necessary in open track to provide for considerable expansion and contraction, has been discarded in favor of the round hole where the track is to be embedded in pavement and so not subjected to a great range of temperature fluctuation.


Machined bearing plate
20"
$3\frac{1}{16}$" 5" $3\frac{7}{8}$" 5" $3\frac{1}{16}$"
$\frac{29}{32}$"
1"
A.E.R.A. standard 5"-80 lb rail
$\frac{7}{8}$"
Base plate
Machined bearing plate
20"
$1\frac{1}{32}$"
$1\frac{1}{8}$"
$3\frac{1}{16}$" 5" $3\frac{7}{8}$" 5" $3\frac{1}{16}$"
A.E.R.A. standard 6"-100 lb rail
1"
Base plate
$4\frac{1}{2}$" 9" $4\frac{1}{2}$"
9"
2 Circular holes in plates, $1\frac{1}{32}$" diam.
$3\frac{15}{16}$"
18"
A.E.R.A. standard 9"-134 lb rail
$1\frac{3}{8}$"
Steel tie

The Three Standard Rails of the Connecticut Company, Showing Location of Joint Welding Seams

The object sought in the welded joint is to arrest entirely any longitudinal motion in the individual rails. When these joints are bolted up, the two outer bolts are first installed, requiring the rail ends to be tightly butted together. Machine bolts $\frac{3}{32}$ in. smaller than the hole are used. This size has been found to give a good tight fit in actual practice. In fact, in some cases, it has been necessary to ream the hole to get the bolt in. The two inner holes are made $\frac{1}{8}$ in. greater in diameter than the bolt to admit of easy entrance and to speed up the work.

METHOD FOLLOWED IN WELDING

Before a start is made to weld the seams, it has been found desirable to look first over the alignment of the joint in the track. This is particularly important on curves, since the order in which the seams are made can improve or upset the alignment. The first seam made has a tendency to push the rail away from the operator and change the alignment.

Of equal importance is the grade or vertical elevation of the joint, which should be checked up with a 3-ft. straight-edge before being welded. In the manufacture of rail there is a tendency for the rail end to drop, so that if this is found to be the case, the welding of the base seam first will have a beneficial effect in tending to raise the end of the rail slightly.

The location of the first seam to be welded is then preheated by passing a long carbon arc for a few seconds over it. The seams are then made with the carbon arc, using the "hand-fed" steel method, which has now supplanted the "laid in" method. The depth of the seam is such that it is at its deepest at the middle of the seam, tapering off at the ends to avoid undesirable craters. Close attention is also given to staggering all seams, top with bottom and side with side, including those on the base plates. This tapering and staggering and the other methods mentioned later are important factors in eliminating entirely broken rails due to crater notches. It is the practice on the Connecticut Company also to weld a second time for a few inches in the middle of the top seams, and correspondingly to break off for a few inches in the middle of the bottom plate seam. The completion of each seam weld is followed by post-heating with the long carbon arc, in the same manner as in preheating.

HOW CONTRACTION STRAINS ARE AVOIDED

For some time it has been recognized that the welding of rail joints sets up a considerable contraction strain in the track as a whole, due to the work being done in warm weather. When the rail is at its maximum expansion, if the contraction strains are not guarded against and there is a drop in temperature on construction work which includes special trackwork within its limits, damage to the special trackwork is apt to occur if the welded joints and rail prove to be the stronger. To guard against this contingency, it is the practice of the Connecticut Company to leave the joint unwelded and the bolts tight in one end of the plate only where the welded track meets special work, even though it is to be paved up. Then this open joint is filled in and welded in midwinter when the welded track is at maximum contraction.

It would be possible to elaborate on many of the details that enter into the materials and labor involved in making these joints, such as the plates, bolts, welding steel and their chemical properties, carbon electrodes, fluxes, etc., as well as on the cleaning and setting up of the joints, the amount of current, speed of welding, etc. All of these are important factors in securing good results, but as the practice of the company in these details probably does not differ greatly from that of other companies, the mere mention of them must suffice at this time.

It is believed that these joints, which are economical in first cost, will prove in service that to all intents and purposes the process has produced a continuous rail in which joints are conspicuous only by their absence.

It is but fair to say that much of the credit for research work along this line can be attributed to the manufacturer. The instances of the co-operation between the engineer and the manufacturer, which have obtained during recent years in connection with welded rail joints, must be most gratifying to all concerned.

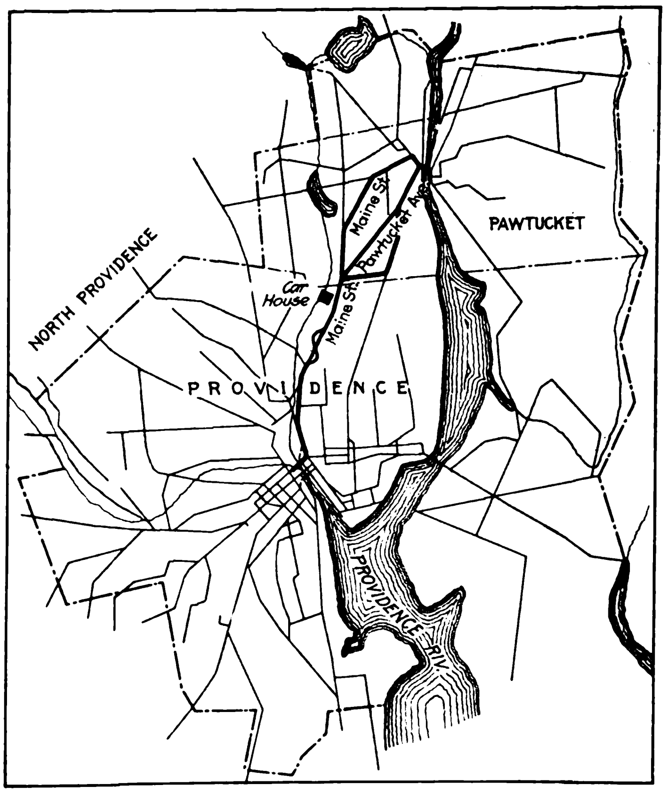
This work is under the immediate supervision of the three division engineers of the Connecticut Company maintenance of way department, M. M. Johnston, A. L. Donnelly and H. J. Tippet, who have developed several of the features in connection therewith.

This department reports directly to the vice-president and general manager, J. K. Punderford.

Third Track Turnouts Save Nine Minutes Running Time

The United Electric Railways, Providence, R. I., Operates Express Service to Pawtucket on a Five-Minute Headway Over the Same Route as Local Service

ONE of the most heavily traveled routes of the United Electric Railways is from Providence to Pawtucket, a city of about 50,000 people lying immediately adjacent to the larger community. Inasmuch as a large part of the travel is through-riding from one city direct to the other, it was thought desirable to install express service. This was done in the latter part of last year by building passing tracks alongside the existing double tracks.



Special Turnouts Enable Express Cars to Pass Locals Between Providence and Pawtucket

The route from Providence to Pawtucket follows North Main Street for about two-thirds of the distance. Just inside the city limits of Pawtucket, however, the service divides three ways. Some cars operate via Pawtucket Avenue directly to the heart of that city. Others branch off to the west and go in via Main Street, while still others follow a route to the east of Pawtucket Avenue. The greater part of the service follows Main Street and it was therefore quite feasible to operate the express service via Pawtucket Avenue provided some

"EXPRESS"
PAWTUCKET
PAWTUCKET AV
GARDEN ST.
DIVISION ST
2113

Exchange Place Loop, Where Pawtucket Express and Local Cars Start way could be found to enable the express cars to reach the junction immediately ahead of a local Pawtucket Avenue car rather than close behind one.

To do this it was decided to build a pair of passing sidings on North Main Street, about one-third of the way to Pawtucket. The passing tracks are staggered, that for inbound cars being just beyond that for outbound cars. On account of the moderate width of the street it was thought undesirable to have the four parallel tracks all together. The carhouse, which is just south of the junction and the Pawtucket city line, provides another place where the express cars can pass the locals. The relative position of these points is shown on the accompanying map.

Express service is operated on a ten-minute headway during the day and on a five-minute headway during the rush hours. Local service is on a five-minute headway throughout the day and the rush hours. In order to take care of the peak extra cars are double-headed with the ordinary local cars. In the afternoon rush hours express cars and locals start simultaneously from Providence with the express car leading. This car should then catch the local car which started five minutes ahead, either at the passing siding or at the carhouse. Shortly after passing these points the express car reaches Pawtucket Avenue and has practically a clear right-of-way from there into the center of Pawtucket.

The location of these three possible passing points, the recently built sidings, the carhouse and the junction, lying as they do comparatively close together, makes it unnecessary to designate any hard and fast passing point where the express car gets ahead of the local. The procedure is simply for the express to run as rapidly as possible without stops and to pass the local at the first available point. By this means the running time has been reduced from twenty-seven minutes, the present schedule for local cars, to eighteen minutes for the express. Riding between Providence and Pawtucket has increased considerably since the inauguration of express service. Apparently this has been accomplished with no loss whatever to the local traffic. The gain being derived entirely from new riders.

Trackless Trolley Experience on Staten Island

THE trackless trolleys have given satisfactory service on Staten Island, according to Grover A. Whalen, Commissioner of Plant and Structures, New York City, writing in the *American City Magazine.* The original lines installed by the city of New York from Meiers Corner to Linoleumville and Meiers Corner to Seaview Hospital, opened to the public in October, 1921, were equipped with the Atlas trackless trolley, arranged to seat thirty-two passengers and to carry a maximum of seventy. The motors are series wound and of 25 hp. each, connected together mechanically by means of a propeller shaft which extends to a worm gear to drive the rear wheels. The wheels of the car are 36 in. diameter of the cushioned rim, cushion tire type. This installation was described in ELECTRIC RAILWAY JOURNAL, Oct. 15, 1921, page 67.

These initial lines, according to Mr. Whalen, passed through the severe winter of 1921-22 without an interruption of traffic, even though the other means of transportation on the island were frequently interrupted on account of snow or sleet. In fact, service was so satisfactory that when the residents of Tottenville, at the southwesterly tip of Staten Island, expressed a desire for a cheap method of travel to the ferry at St. George, by means of which connection is made with Manhattan, it was decided to extend the St. George-Richmond division of the Midland line (city operated) to Tottenville by means of a trackless trolley. The distance from Richmond to Tottenville is approximately 10 miles.

The new line, opened Nov. 4, 1922, was described in ELECTRIC RAILWAY JOURNAL, Nov. 11, 1922, page 293. The overhead construction is the same type as that employed in the earlier trackless trolley systems on the island.

The first trackless trolley purchased by the city had unnecessarily high road clearances and too narrow wheel treads, says Mr. Whalen, and were somewhat uncomfortable on account of a side-swinging motion. The engineers of the Department of Plant and Structures studied the problem and evolved a trackless trolley bus which has a much smaller road clearance, so that only one step is needed for car entrance. It has a much wider wheel tread, eliminating side motion, and a long wheel-base, giving greater comfort in riding and an improved appearance. The vehicle power plant and general means for operation were not altered, as these proved very satisfactory in the original cars. The new type vehicles were built by the Brockway Motor Corporation and have given satisfaction.

Regarding cost of operation, Mr. Whalen states that it costs 25.6 cents per mile to operate the trackless trolley over the roads in Staten Island, and it costs about 33 cents per bus-mile to operate a gasoline bus of the same capacity over the same roads. These costs include every item, such as interest on first cost of the entire investment, depreciation and maintenance, power for operation, labor for operation, administration, etc.

An advantage of the trackless trolley, he says, is the psychological effect. The general public has learned that while a bus line may be operating to feed some real estate development, there is no assurance that it will continue after the property of the development scheme has been sold; in fact, the public has learned the contrary. The trackless trolley, employing a relatively expensive overhead construction, conveys the assurance that this transportation is of a permanent nature. The advantage over the ordinary trolley system is that the trackless trolley requires no expensive track construction, which at the present time for the ordinary trolley, Mr. Whalen states, may vary from $40,000 to $200,000 per mile, depending upon the territory through which the system is to operate and the type of track construction required. The absence of this track construction naturally reduces the first cost of installation very markedly, and therefore the fixed charges.

Special Sign Painted on Dash

ON THE passenger cars of the Harrisburg Railways the word "special" is painted directly on the dashboard under the right-hand platform window. Ordinarily a route sign hangs over this word, concealing it from public view. In an emergency when it is desired to operate some car "special" it is necessary only to remove the route sign and the proper designation then appears. It is said that this plan has proved very useful in emergencies by insuring the presence of a special sign on every car.

Association News & Discussions

Optimism Features Illinois Utility Meeting

Improvement in Spirit Attributed to Co-operative Effort—New Speaker's Bureau to Tell Utility Story in Local Talks Throughout the State—Railway Men Discuss Publicity, New Cars, Bus Operation and Track Construction

IN CONTRAST with similar meetings of only a very few years ago, the joint meeting of the Illinois gas, electric and electric railway associations, held at the Hotel Sherman in Chicago on March 26 and 27, was marked by a very obvious spirit of optimism. A record attendance at all of the meetings, a full program of timely and constructive papers, accompanied by animated discussions and favorable reports of relations with the public in various locations, were some of the outward evidences of the present spirit.

B. J. Mullaney, chairman at the dinner on Wednesday evening, called attention to the change which has occurred in the utility viewpoint during the past five years. "The atmosphere of this meeting," he said, "is marked by a total absence of that tendency to cry about our troubles which tinged some of our comparatively recent past meetings." Contrasting the present conditions with those of only five years ago, he attributed the improvement to the birth of a new spirit of co-operation among the utilities themselves and to a determination on their part to face their difficulties with a united, constructive effort. Success in telling the utility story to the public, he named as one of the primary reasons for the improved conditions.

Reports from the chairmen of each of the ten pulbic service speaker's bureau districts into which the state has been divided indicated considerable progress in the work of organizing the utility men in each district and in the compilation of lists of schools, civic, business and social organizations to be addressed by speakers working under the direction of the bureau. As outlined by the various district chairmen, this new activity has been given a favorable reception in those instances where talks have been given. It was reported that the people of the state seem to be genuinely interested in the information which the utilities have to impart.

Selection and development of employees to make simple talks outlining facts about utility business was considered an important part of the local committee activity. Posting all employees on such facts relative to their business as would enable them to answer questions in their daily contact with friends and customers was also held to be an important phase of the work.

Mr. Mullaney pointed out the importance of co-ordinating this new local activity with the work of the Illinois Committee on Public Utility Information, and explained that the publicity work of that committee as carried on through the newspapers and schools is of very material importance in arousing public interest in utility affairs and in making local audiences receptive and ready to hear the story told by the speaker's bureau representatives.

RAILWAY MEETINGS IN AFTERNOON

Both morning sessions were joint sessions, devoted to the general interests of the three associations. In the afternoons each association met separately for the presentation and discussion of technical papers.

The Wednesday afternoon session of the Railway Association was taken up by the presentation and discussion of papers on "Educating the Public," by Luke Grant, and on "Education of the Employees of the North Shore Line," by C. G. Goodsell. These two papers are abstracted elsewhere in this issue, along with a written discussion by W. H. Sawyer, which in the absence of Mr. Sawyer was read by Mr. Mitchell, East St. Louis, Ill.

J. R. Blackhall, general manager Chicago & Joliet Electric Railway, commended the publicity and educational work of the North Shore Line and stated that the industry owed a debt of gratitude to the management for the outstanding example which this property has furnished of the results which can be accomplished through properly planned and directed work of this kind. Mr. Blackhall was in entire accord with the idea of giving service first and then following with proper publicity. The resources of the small property do not allow the degree of specialization which can be carried out in the organization of the larger properties, and for that reason, according to Mr. Blackhall, the duties incident to publicity and educational work must be shouldered by the officers on the small property.

From the standpoint of the results which can be accomplished, he said that this difficulty is more than offset by the close contact between the management and its men on the one hand and between the management and the community served on the other. He maintained that the most important requirement for success is a proper appreciation by the small property manager of the results which can be accomplished by proper cultivation of the right kind of contact with both the community and the men of the property.

Prompt attention to complaints, which generally require only small expenditures for removal of the cause, were cited as a method of obtaining big returns in the form of a friendly public attitude. Settlement of damage claims whenever this is possible, in place of litigation, was mentioned as another effective method of inspiring good will.

Mr. Blackhall indorsed the speaker's bureau work and stated that in his opinion the majority of the public is essentially fair, and if the local utility has done its part in rendering the best service possible under given conditions the public is willing to listen to the utility side of the story. He said that the proper kind of publicity, particularly that prepared by the committee on public utility information, has helped a great deal in obtaining increased rates and in pointing out to the public the effects of automobile competition on railway service. He showed how proper activity by utility managers has put this industry among the leading industries of the community, fast resulting in utility men being given a leading place and taking a leading part in the activities of community civic organizations—Kiwanis, Rotary and similar clubs.

EXECUTIVES HAVE REQUIRED EDUCATING

F. E. Fisher indorsed Mr. Sawyer's views that it has frequently been the railway executives who required the educating as much if not more so than the public.

D. E. Parsons stated that personal contact with complainants was a successful method of making friends. He said that by getting in touch with the author of a complaint, either in the company's office or through a personal call, a friendly spirit of co-operation can be engendered which in most cases makes a booster for the company.

W. S. Vivian discussed the employee educational work which is being carried on by the Midwest Utilities Company, and also cited examples of previous work which he had done in training inexperienced employees to speak before large audiences. Not only does this kind of work accomplish very satisfactory results from the standpoint of "getting the story over," according to Mr. Vivian, but it soon receives the very enthusiastic support of the employees themselves, who become keenly interested.

To illustrate the extent to which public utility managements have become educated on the need for proper contact with their public, Mr. Grant cited examples from his experience in newspaper work. He said that in some cases he had had difficulty in getting an audience with a utility executive to obtain a confirmation on a commendatory story which had come to a newspaper's attention.

Mr. Bosenbury advocated the Golden Rule as a safe policy in dealing with the public, and T. C. Roderick cited the value of frank statements through paid newspaper space in obtaining sanction of one-man operation in the tri-cities.

At the request of J. P. Barnes, chairman of the committee on co-operation with state and sectional associations, G. W. Welsh discussed briefly the activities of the new committees on city and interurban operation.

MOTOR BUS OPERATION

A paper by G. T. Seely on motor bus operation, which is abstracted elsewhere, opened the Thursday afternoon session. In the general discussion which ensued motor buses were held to have a place in the field of passenger transportation and to be particularly valuable for handling feeder service and for furnishing extensions to existing lines without the heavy investment required for additional railway construction.

Mr. Parsons advised close watch by railway men of the trucking activities which have followed the completion of hard roads, and stated that co-operation with the truck men would frequently result in inducing them to act as feeders to the railway lines. Mr. Roderick stated that two buses which are now in operation as feeders on the Tri-City property obviated the construction of an extension. These buses, he said, are being charged off on a depreciation basis of 250,000 miles, which at 50,000 miles per year will give an estimated life of five years. Charging the buses with a proportion of the railway overhead, on the basis of mileage, he estimates a total cost per mile of 18 cents.

In reply to a question, Mr. Seely stated that he favored buses of large seating capacity for city service, pointing out that the operating costs are not much greater than for smaller capacity vehicles, and the larger peak load capacity is very desirable.

LIGHT-WEIGHT CAR CONSTRUCTION

H. H. Adams presented a paper on light-weight car construction, which is abstracted elsewhere. This was illustrated by lantern slides. Mr. Adams amplified his paper by a brief discussion on the automatic doors planned for use on the new Chicago cars. In relieving both the motorman and conductor of the duty of watching out for alighting passengers, these doors, he said, would give the trainmen more time for attention to their other duties and would thus lead to greater accuracy in the collection of fares and increased safety of operation. In addition, he said, the public would be given a favorable impression of improvement and progress by the use of these doors on the new cars.

J. M. Bosenbury pointed out that the problem of a great many interurban properties was to obtain light-weight equipment which would allow a more frequent service and increased speed. For smaller communities he held that the small single-truck type of one-man city car gave satisfactory results.

S. Clay Baker, engineer maintenance of way East St. Louis & Suburban Railway, East St. Louis, Ill., read a paper outlining some problems involved in the construction and maintenance of electric railway track. He said that to his mind "there are many problems confronting the way engineer of the future. With the scarcity and rapidly advancing prices of wooden ties, it seems to point to the use of a substitute which will require the use of concrete to obtain the necessary bearing value. Many properties are realizing the importance of this and are experimenting with the designs now available. Another argument in favor of the solid concrete type is the fact that the surface pavement has a very definite foundation that will withstand the excessive wheel loads of vehicular traffic. To develop the track of the future the principle of the resilient track structure cannot be lost sight of for past experience has led us to believe that this is the important factor in street railway track design.

"Another problem, and one which you now hear discussed by many engineers, is the subject of noise and vibration due to passing cars on a railway track. This is a growing demand of the future, and while it may be alleviated by the type of track structure in use, it may also be influenced by the design of the paving. The various block pavements previously laid with cement grout filler are now being installed with a bitulithic filler with noticeable results. This is especially true on ballasted type of construction where wood ties are used. The reduction of noise and vibration, to my mind, is a refinement of the future and will be taken into consideration in the track designs.

"I also believe it is well to call attention to the progress that has been made during the last few years in the standardization of track materials and the setting forth of recommended practice, thereby eliminating many problems confronting an engineer in determining the most suitable material or design to meet a given condition. This has been especially noticeable in bringing about co-operation with the manufacturers of track and equipment materials. Standard special work layouts may be purchased to meet all traffic conditions. Standard switch pieces, mates, frogs, etc., may be purchased for less than formerly due to the fact that the handling of shop details have been cut to a minimum. In the recommended standard rails there is a section designed to meet any traffic condition and the engineer adopting any one of them will find the particular design entirely suitable to meet his requirements. You can easily see that the way engineers of the future will find it an excellent policy to proceed along lines of recommended practices and thus be able to solve his own problems by the advice and experience of others in the industry perhaps more experienced than himself."

J. B. Tinnon, Joliet, Ill., said that it is frequently a serious problem to find the money with which to take care of needed reconstruction and maintenance of track, but it is most important that a way be found to keep the track in the best possible condition. In each case, he said, the construction adopted is a compromise between the requirements of vehicular and car traffic, and the car design plays a very large part in the results obtained from any type of track. He held that improvements in car design which will remove a part of the present large unsprung loads will do a great deal toward allowing the use of a type of track construction which will give good riding, reduction of vibration and long life.

Mr. Tinnon emphasized the advantages of utilizing standard materials and parts. He also stated that the practice of contracting construction work under proper inspection and supervision would merit serious consideration on many smaller properties where expensive hand labor was being used for such construction due to lack of proper machine equipment.

NEW OFFICERS ELECTED

The report of the nominating committee was read by D. E. Parsons and resulted in the election of the following officers and executive committee for the ensuing year:

President, R. A. Moore, general manager Aurora, Plainfield & Joliet Railroad; first vice-president, J. F. Egolf, Aurora; second vice-president, C. F. Handshy, Springfield. Directors: W. C. Sparks, Rockford; F. J. McClure, Aurora; D. E. Parsons, East St. Louis; W. A. Baehr, Chicago; A. D. Mackie, Springfield; B. I. Budd, Chicago; J. R. Blackhall, Joliet; W. L. Arnold, Chicago.

At the dinner on Wednesday evening Floyd W. Parsons named customer ownership and consistent advertising as the two most important factors essential to the continued success of the public utilities. He pointed out the close dependence of the prosperity of industry in general on the utilities and painted a mental picture of the outstanding industrial progress which may be expected in the future.

Slotted Head Screws Standardized

A PAMPHLET giving tentative standard sizes of slotted heads for machine and wood screws has just been published by sub-committee No. 3 of the sectional committee on the standardization of bolt, nut and rivet proportions organized under the procedure of the American Engineering Standards Committee. The committee is anxious to have criticisms of these proposed standards before final drafts are submitted for approval. Copies may be obtained gratis by addressing C. B. Le Page, assistant secretary of standards, American Society of Mechanical Engineers, 20 West Thirty-ninth Street, New York, N. Y.

Philadelphia Section, A.I.E.E., to Discuss Electrification

RAILROAD electrification will be the subject of the April 14 meeting of the Philadelphia Section, A.I.E.E. The speaker scheduled is H. Van Buren Duer, electrical engineer of the Pennsylvania System. The Philadelphia Section, in anticipation of the large attendance, has engaged the ballroom of the Bellevue-Stratford Hotel for the meeting.

Light-Weight Double-Truck Car Design*

By H. H. Adams
Superintendent Shops and Equipment Chicago Surface Lines

In treating the subject of light-weight double-truck cars the writer is taking advantage of some recent work along this line upon the Chicago Surface Lines and will confine himself largely to a discussion of the problems considered in developing the design of this group of cars that are about to be built. He desires it understood, however, that in the treatment of the light-weight car he is dealing with conservative design, in which strength has not been sacrificed at any point for the question of weight, and in some cases, where the comfort of passengers is involved, additional weight has been put into the car. Furthermore, in the design an effort has been made to produce a pleasing car, having good lines, which presents an attractive appearance inside and out, as it is believed that such a car is a real asset. This last result in the Chicago Surface Lines car has been accomplished without adding to the weight.

The proposed cars are to be of the double-truck, two-motor, plain arch-roof type, without bulkheads, and provided with pneumatically operated doors on each side of each platform, and so arranged that they may be operated as single units or in trains of two or possibly more cars. On one side of each platform an automatic exit door is provided.

The dimensions of these proposed new cars follow:

Length over bumpers	48 ft. 11 in.
Length over corner posts	32 ft. 9 in.
Length of platform	8 ft. 1 in.
Width over drip rails	8 ft. 6 in.
Width over side girders	8 ft. 4 11-32 in.
Height from rail to top of trolley boards	11 ft. 6 in.
Truck centers	22 ft.
Seating capacity (car body)	48
Seating capacity (platform)	6
Total seating capacity (single unit)	54
Estimated weight, completely equipped	38,000 lb.

In operating these cars in trains of two it is believed that a great advantage will be obtained by the proposed arrangement for loading passengers at the center of the train, so that the boarding passengers may enter at one general location, rather than to split up the loading points, as would be necessary in other types of cars. This decision as to the method of loading was arrived at after studying various loading problems in connection with surface car train operation, and it has been demonstrated that a more equal distribution of the passenger load is obtained by this method.

In considering the weight of a car in relation to the entrance and exit facilities, it is not believed that too much consideration should be given to the use of but one step between the car floor and the street level, as it has been found that where steps are reasonably low and comfortable and a landing platform (or what is termed in some cases reservoir capacity) of sufficient size is provided, the movement of passengers is accelerated, even though another step is imposed in the form of a riser, from the platform to the car body, or from a well in the center of the car to the car body.

Wheel diameters affect this question, and in some cases where 26-in. wheels are used it is possible to get a low step, and at the same time, by means of ramps, so to design the entrance and exit passageways that one step only is required between the street level and the main floor of the car. In the writer's opinion, however, this practice does not tend to produce as good design as that of the drop platform or the well depression in the center of the car.

The side girder construction of this car consists of plates of No. 12 sheet steel, 30 in. wide, reinforced at the top and bottom, to which are riveted U-shape steel posts. These posts are riveted at the top to a sheet steel letterboard. The whole side of the car from the bottom angle to the top plate forms the girder for the car body.

The side posts are made of No. 16 gage steel, formed into a U-shape, with the closed end riveted to the side girder sheet. The wood filler is inserted in the open end of this U and is 1¼ in. deep. The parting strips and pilasters are screwed to this wooden strip. This type of post was used in a lot of 45 double-truck, one-man cars that were built and placed in service about a year ago, and satisfactory results have been obtained from them up to the present time. (See Electric Railway Journal, issue of Jan. 14, 1922. A number of them have been damaged by collisions, but it has been found that repairs can be readily made, with little or no more expense than in the case of wooden posts. This U-shape post is lighter and stronger than any other type of metal post we have been able to design. It is 27 per cent lighter than the 1½-in. x 1½-in. T-post which is being used somewhat generally in car construction at the present time. Tests have shown that the U-shape post, in comparison with the T-post, has 12 per cent less deflection, figured in 1,000 in.-lb., of bending moment when applied in the transverse direction of the car body. When the bending moment is applied in the longitudinal direction of the car body the U-shape post has a deflection which is 76 per cent less than that of the T-shaped post. The figures for both weight and deflection are for complete posts, with wood fillers or covering.

The wood filler for the U-shaped post has been so designed as to be readily removed to permit painting of the posts on the inside.

Plywood, ¼ in., is to be used for the roof. This is screwed to the wooden carlines and made in three sections, with butt joints. This plywood roof, shaped to form, we find to be very stiff and lighter than the ⅜-in. roof made with poplar boards, and while the cost is approximately 90 per cent in excess of the cost of the ⅜-in. poplar finished roof board (material only), the labor of installing the plywood roof is less than that of installing the poplar. The total cost of the plywood roof installed exceeds that of the poplar roof by about $30 per car, but as there is a saving of approximately 200 lb. per roof, we believe that we are warranted in making the increased expenditure, hoping that with a more general use of plywood for this purpose the cost will be reduced.

By the use of plywood, which gives a stiffer roof construction, we are enabled to use a lighter steel carline, the dimensions of which are 1½ in. x ¼ in. This compares with a steel carline 1½ in. x ⅜ in. used with the poplar roof construction. This reduction in weight of the steel carline is included in the 200 lb. saving in roof construction weight.

Experience has shown that the roof covering of a car is something that needs special attention, and that the ordinary procedure of covering a roof with cotton duck laid in white lead and painted with roof paint does not necessarily make a tight roof covering. It has been found necessary to use either prepared roofing materials or to treat the canvas with a waterproof treatment, which permits the canvas to remain in a flexible, soft condition throughout its life. The use of white lead and the usual roof paints, when applied upon the untreated cotton duck, generally results in the cracking of the paint. This permits rainwater to work through the cracks and the seeping action seems to extend clear through the canvas. By the proper treatment of the duck, or the use of treated canvas, this difficulty is avoided.

Cast steel bolsters of I-beam section 10 in. deep in the center are used. The average weight of these bolsters is 520 lb. These bolsters are tested with a center load of 22 tons, with bolster supported at side sill supports.

The length of the platform used upon the Chicago cars is much longer than that of the average city car, extending 8 ft. 1 in. from the end sill to the outside bumper. The outside platform knees are formed of 8-in., 13.75-lb. channels, reinforced top and bottom with 2-in. x 2-in. x 5/16-in. angles. In addition, the web is reinforced at the point of support with a 7-in. x ½-in. x 32 5/16-in. plate.

It is desirable to keep the fiber stresses in the platform knees low, and it is the practice in Chicago to keep the stresses below 10,500 lb. per square inch. The point of maximum stress occurs at the end sill. The platform framing is designed for the use of radial couplers and ample cross bracing is provided.

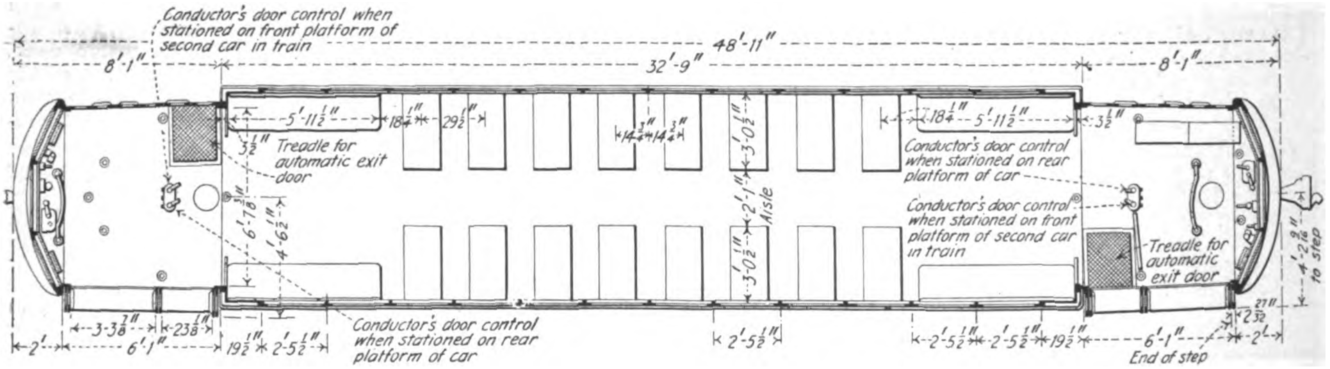
Chicago's climatic conditions necessitate the use of a double floor for warmth, and in order to obtain this with as light a construction as possible the practice has been as follows. The lower floor is ⅝-in. thick fir, then a layer of 1/16-in. thick building felt, on top of which is laid a ⅝-in. maple floor. In the aisles the ⅝-in. maple floor is grooved to form the aisle mats. This makes a total thickness of floor of 1 5/16 in., and while the weight is in excess of a single 1 3/16-in. floor, it is necessary, as previously stated, for the local conditions, and illustrates a condition where weight is added to the car to provide for the comfort of passengers.

This design of car calls for two trapdoor openings over each motor, with a space of about 8 in. of flooring between the trapdoors, which is built in solid between two tees. This 8-in. strip is built in so as to form a solid fastening for the motor cables and motor junction boxes, which are installed at this location.

---

*Abstract of paper presented before Illinois Electric Railways Association, at Chicago, March 26-27, 1924.

The posts are spaced 29½ in. center to center, and the lower and upper sash are designed so as to permit the use of standard size glass, thus eliminating the necessity of glass cutting. The lower sash takes a glass 24 in. x 26 in. and the upper sash 14 in. x 26 in. In this connection, the writer desires to point out that these dimensions correspond with the recommendations of the committee on unification of car design, as presented to the American Electric Railway Engineering Association, in convention, October, 1922, which recommendations, it is understood, are to be reaffirmed this year, and he desires to show that this represents good practice in car construction, the Chicago Surface Lines having used them upon the last four groups of cars designed totaling 445 cars.


Conductor's door control when stationed on front platform of second car in train
48'-11"
8'-1"
32'-9"
8'-1"
5'-11½"
18¼"
29½"
14¾"
14¾"
3'-0½"
2'-1"
Aisle
3'-0½"
3½"
Treadle for automatic exit door
6'-7⅜"
4'-6½"
18¼"
5'-11½"
3½"
Conductor's door control when stationed on rear platform of car
Conductor's door control when stationed on front platform of second car in train
Treadle for automatic exit door
4'-2$\frac{9}{16}$" to step
2$\frac{27}{32}$"
3-3⅞"
2⅜"
2'
6'-1"
19½"
2'-5½"
Conductor's door control when stationed on rear platform of car
2'-5½"
2'-5½"
2'-5½"
19½"
6'-1"
2'
End of step

Floor Plan of Proposed One-Man, Two-Man, Multiple-Unit Cars for Chicago, for Use in Trains

Each platform is provided with three sets of doors on each side, pneumatically operated and controlled in the following manner:

All doors swing outward. On the left hand side of the platform No. 1 end the three sets of doors are to be operated in unison from one door engine and are to be controlled from the conductor's door control valve, located in a conductor's door control stand. The corresponding doors on the right hand side of the No. 2 end of the car are to be operated in the same manner. On the right hand side No. 1 end the two sets of doors nearest the vestibule corner post are to be operated in unison from one door engine controlled by either the motorman's brake valve or the conductor's door control valve. The one set of doors nearest the body corner post are to be automatically operated by another door engine, by means of a treadle, and are put in operating position either by the motorman's brake valve or the conductor's door control valve. The corresponding doors on the left hand side of the No. 2 end are to be similarly operated. The piping is to be so arranged that three sets of doors on the right hand side No. 2 end may be controlled from the conductor's position at No. 1 end, and the corresponding doors on No. 1 end are to be controlled from the conductor's position at No. 2 end. This permits the remote control of these doors at terminals, or for use in the future at subway stations. In addition, the last-mentioned sets of doors on each platform are to be arranged with a street collector's valve, for operation from a position in the street, at congested points on lines or at terminals. The decision to install automatic doors on these cars was arrived at after careful study and a thorough trial on a group of 45 cars, which have been in successful service for a year or more. It was decided that automatic doors would facilitate the exit of passengers, both when the cars operate as single units or in trains of two or more cars.

The type of electrical equipment to be used; that is, whether four-motor or two-motor, affects the problem of weight, even though the total horsepower of the motors is practically the same. In other words, a car that is designed to operate at good motor efficiency equipped with two 60-hp. motors will weigh about 1,000 lb. less than if four 35-hp. motors are used. (This would be the size of the motors that would have to be selected as being the nearest in equivalent horsepower to the two 60 hp. motors). The four 35-hp. motors would, of course, give a surplus of 20 hp., or an increase of 16⅔ per cent. In addition to the saving in weight there will be a substantial saving in the initial cost of the electrical equipment by using two 60-hp. motors.

In analyzing some of the weights per horsepower, based upon the manufacturer's rating of the motors, and the light weight of cars, it is found that with four-motor equipments that were placed in service about 1907-08 the weight ran about 265 lb. per hp. This was with motors of the non-ventilated type that had armature speeds of approximately 635 r.p.m. at 600 volts. An analysis of recent four-motor equipments installed in Brooklyn, St. Louis and Boston shows 285 lb. per hp., or an increase of 7.55 per cent. These last cars are equipped with motors having, in the case of Brooklyn and St. Louis, armature speeds of approximately 1,125 r.p.m., and in Boston 1,236 r.p.m. at 600 volts.

In the two-motor equipments, it is found that some of the light-weight equipments designed and put in service in 1912-13 averaged around 300 lb. per hp., and at the present time, we find that an analysis of the two-motor equipment of the latest Philadelphia Rapid Transit Company's double-end car runs about 314 lb. per horsepower. The proposed Chicago Surface Lines car will run about 316 lb. This gives an average of 315 lb. per horsepower, which is a 5 per cent increase over and above the 1912-13 average. The latest design of two-motor equipments has armature speeds of from 725 to 770 r.p.m. at 600 volts.

The above illustrates that there has been a gradual tendency to increase the weight per horsepower based upon the light weight of the car. This has been brought about by the lighter weight, higher speed, ventilated type of motor.

From tests recently made with modern two-motor equipments upon a car weighing light 38,000 lb., in service where the schedule speeds have run as high as 12.5 m.p.h., with stops of approximately six per mile and of six seconds duration, it has been found that on these modern two-motor equipments the average temperature rise has run very close to 55 deg. C., showing that from the standpoint of heating the motors are capable of taking care of a load of at least 315 lb. per horsepower, without excessive temperatures. The above figures are based upon tests made in Chicago upon one of the fastest crosstown lines. The average passenger load during the tests was 37.

It is believed that in the selection of an equipment for light-weight city service cars serious consideration should be given to the use of the two-motor equipment, for the following reasons:

1. A two-motor equipment is lighter than the corresponding four-motor equipment of the same, or approximately the same horsepower.
2. The first cost is less per equipment.
3. Lower armature speeds.
4. The use of two large units instead of four smaller units.
5. Lower maintenance.

In considering the use of a two-motor equipment, due allowance has to be made for local conditions, as it is recognized that while these equipments may be operated in territory where grades as high as 5 per cent or even greater are encountered, for grades in excess of this a four-motor equipment would probably be desirable. A careful analysis should be made covering each condition before a final decision is reached.

The control equipment under consideration for use on these cars is the light-weight multiple-unit type.

We have specified on this group of cars a 10-in. x 12-in. brake cylinder, with an idea of equipping our cars so as to give a braking ratio not to exceed 1 to 10, in order to get the best possible results from the standpoint of a liberal range in the brake adjustments. This, we believe, will reflect itself in our power consumption, by permitting our brakes to be adjusted freer and, at the same time, operated with adequate safety.

The heating equipment to be installed in these cars consists of 22 heaters of 400-watt capacity at 500 volts, and two platform heaters of 1,200 watts each, making a total of 11.2-kw. capacity for the heaters. All heaters in the car body are under thermostatic control. The platform heaters are to be wired in series, under independent switch control. This gives a heating capacity of 4.6 watts per cubic-foot of contents.

In deciding upon the seats to be used in these cars, it has been determined to use spring cushion backs as well as spring cushions, in order to give added comfort. This is another item where weight has been added for the comfort of the passengers.

The trucks will be of the maximum traction type, with 63 per cent of the weight on the drivers. The diameter of the driver wheels is 28 in. and the pilot wheels 21 in. By using a maximum traction truck instead of the usual type for four-motor equipments, a considerable saving in weight is made.

The cars are to be provided with automatic car and air couplers. This equipment usually runs slightly less than 1,000 lb. per car. Electric jumpers will be provided between cars for carrying train line and bus line circuits.

The total weight of the car, completely equipped, is estimated at 38,000 lb., subdivided as follows:

	Weight in Pounds	Per Cent of Total
Bare car body	14,500	38.2
Trucks, complete with wheels and axles, but without motors and gears	10,200	26.85
Total electrical equipment	6,590	17.33
(Motors, lb. 5,000 13.10%)		
(Control equipment, lb. 1,590 4.18%)		
Air brake and piping	1,765	4.63
Hand brake, seats, heaters, registers, thermostats, conduit and fittings, destination signs and miscellaneous	3,965	10.41
Couplers	980	2.58
	38,000	100.00
Weight per foot, over all	776	

How the Motor Coach Can Be Utilized in the Transportation System*

By G. T. Seely

General Sales Manager Yellow Coach Manufacturing Company

SMOOTH, hard surfaced roads are essential to successful motor coach operation. Little progress was made from 1902 until the last few years, when the number of coaches has increased at a rapid rate because of the more rapid improvement in road conditions.

Quantity production has placed the private automobile within the reach of every one. The yearly production of passenger automobiles and trucks in this country increased from 485,000 in 1915 to 4,012,856 in 1923, or more than eight times. At the end of 1923 there were registered in the United States 15,223,658 automobiles and trucks, or on the average of one for every 7.2 persons.

With this rapid increase in the use of motor vehicles, there came a corresponding improvement in the condition and mileage of hard surfaced roads. While the advantages of good roads have always been apparent, the urge toward improvement and extension of hard roads became greater as the number of persons owning automobiles increased.

Owners desire paving in front of their homes to provide the opportunity to drive their own automobiles to and fro, irrespective of weather or time of year. They cheerfully pay license fees for the maintenance of roads and pavements. Practically all fire apparatus is now motor driven. In cities and villages, deliveries of nearly all such necessities as coal, ice, foods, building materials, etc., are made by motor trucks, made possible by good pavements. In 1923 there were registered in the United States a total of 1,767,515 motor trucks of all kinds, engaged in business enterprises or private hauling.

In the January, 1924, issue of *Bus Transportation* it was estimated that there were between 40,000 and 60,000 motor coaches of all types in service at the end of 1923 in the United States. At the same time there were 83,000 railway passenger cars in operation in this country. These figures show that in a comparatively few years the motor coach has become a most important factor in transportation, even though the number of vehicles thus used amount to approximately only three-tenths of 1 per cent of the total motor-driven vehicles in this country, or 3.4 per cent of the number of trucks in operation.

The essential difference between electric street car or interurban car operation and motor coach operation is that in cities electric cars require an expensive roadbed laid in paved street, or ballast, ties and rails constructed on a private right-of-way for interurban lines; while motor coaches require only a hard surfaced road, used in common by private individuals and the very large number of industrial and commercial vehicles daily engaged in business enterprises.

Motor coaches can make on the average schedule speed as high as or higher than the average street car or interurban line. They have a range in seating capacity from a small 12-passenger vehicle up to a double-deck coach, seating 67 passengers.

There are many electric railways that have miles of tracks that now need or soon will need rebuilding. In many cases these are single-track lines with passing tracks. The growth in traffic due to the growth of the city since the tracks were built makes double-track construction necessary, either now or long before new track would be worn out. In a situation like this the railway manager is faced with an expenditure of from $100,000 to $125,000 per mile of line for new track, a sum practically four times the original cost of one track, due to double track instead of single track, higher standard of costs and more substantial character of present-day track construction. In some cases a street is too narrow to permit double-track construction. A motor coach line has all the operating advantages of a double-track street car line and the only expenditure necessary is that for coaches and a garage.

As a city develops and expands, it has been necessary for the electric railway to extend its lines in very thinly-settled districts.

With such a useful tool as the motor coach, the railway company can agree to furnish service when pavements are built. Because of the universal use of the automobile and delivery trucks, hard surfaced pavements in a new subdivision are much more of an essential than formerly. The railway operator can logically refuse to put $50,000 to $60,000 per mile of single track in subsurface construction on a line that will not pay for years.

In many cities the standard distance between street car lines is from 2,000 ft. to 2,640 ft., this spacing being selected to minimize the expense of constructing the permanent roadway. This arrangement requires a long walk for persons living midway between lines. Wherever such lines require rebuilding, the transportation company may install motor coach service with routes much closer together, reducing the number of vehicles on any given street and reducing materially the average walking distance to and from the transportation line. This will reduce the time required for the journey between the origin and destination of the passenger. This added convenience will materially increase the number of passengers using the transportation lines and induce many to use a public vehicle rather than their own car, thus materially reducing street congestion.

It is possible to install motor coach service on residential streets where it would be impossible to secure the right to construct new street car tracks, because of the absence of objectionable noise from operation.

Electric railway companies may utilize motor coaches also to increase the schedule speeds of their service. One company operated a section of track several miles long from which several radiating lines branched off. Complaints had been received as to the low speed on these lines and the long time required for the trip to and from the center of the city. Motor coaches were employed to handle the local traffic on this section of the line, only a few stops being made by the street cars. Four to five minutes were saved by each street car, enabling a number of cars to be diverted to other uses. The savings more than paid for the addition of the motor coach service and all the patrons of the line were pleased.

In cases where an extension of an existing line is required, motor coaches can be employed to serve the new territory, also serving the outer portion of the existing car line, and then running express with limited stops to the business center, saving time for the longer riders and, by relieving the street cars, either permit the removal of one or more cars, or provide additional seats for an increase in traffic.

---

*Abstract of a paper presented before joint convention of the Illinois Gas Association, Illinois State Electrical Association and the Illinois Electric Railways Association, Chicago, March 26 and 27.

Limited stop service with motor coaches can be employed in any section of a city served by a long car line with heavy traffic. This service can be routed on adjacent streets, relieving congestion on the car line and, by the faster speed, and reduced walking distance, increase riding. Service of this character performed with double-deck coaches presents the possibility in large cities of deferring the construction of subways or elevated railroads in territory outside of the business section, except perhaps in the very largest cities.

Years ago riding on electric cars purely for pleasure in the summer was an established practice. With the advent of the automobile this class of traffic practically disappeared. The motor coach offers the transportation company a new way of securing this pleasure riding, especially if double-deck coaches are used. In many cities, where private automobiles that have been laid up during the winter are put in service in the spring, there is a noticeable drop in street car revenue. The upper deck of a double-deck coach provides a means of pleasure riding that is fully taken advantage of on warm evenings, Sundays and holidays, by those who do not own automobiles and by those who do.

It has been generally considered that the double-deck coach has a field only in the larger cities, but I am confident that it will be demonstrated that double-deck coaches will be found to be a real means of selling transportation in cities with from 30,000 to 50,000 inhabitants. They will be of especial value where there is a lake, park, or place of amusement some distance from the center of the city.

Some electric railway officials feel that motor coach operation is something entirely different from their previous experience. As a matter of fact, practically the same transportation principles govern as in electric railway operation, and there are less operating difficulties because of the flexibility of the gasoline-driven vehicle.

Educating the Public*

By Luke Grant

Manager Publicity Department, Chicago, North Shore & Milwaukee Railroad

EDUCATION of the public is the most important phase of electric railway operation. Without the good will and co-operation of the public no electric railway, or other public service company, can be entirely successful. The truth of that statement is axiomatic. How to educate the public, however, is a real problem. No formula can be given for general application. Each community has its own peculiar problems and its interest is only passive, if it has any interest, in the problems of other communities.

In this brief discussion of the subject I mean to confine myself largely to one phase of the problem. I think it the most important phase. The objective I have in mind is to "personalize" a company. I use the term "personalize" because it seems the most appropriate to express the idea I have in mind.

Since the corporation first was formed to carry on business on a larger scale than was possible for the individual firm or partnership, it has been referred to as "soulless." Without the corporation, modern business could not be carried on, yet it is still spoken of as being "soulless," although less so than was the case a few years ago. Public sentiment is gradually changing, due to the better understanding of the fact that the corporation has developed a soul, or a spirit. In the case of the public utility, at least, it is a spirit of service. If a corporation does not wish to be referred to as "soulless" it must prove by its actions that it is not.

The inspiration for this soul, this spirit of service, must spring from the head of the corporation. It must permeate every department and be infused into every employee from the highest to the lowest. That accomplished, the "personalizing" of the company to its customers—the public—will follow as a matter of course, through the co-operative effort of all the employees.

To the patron of the electric railway the employee with whom he comes in contact is the personification of the company. He is the one who expresses the spirit of service or the reverse. If each employee with whom the passenger has contact makes a favorable impression, the effect is cumulative. He has "personalized" that company to the customer and he extends the contact to others. To illustrate what I mean I will cite one or two typical instances.

Typical Instances Quoted

A young mother, with a baby in her arms, is traveling on the North Shore Line from Chicago to Milwaukee. The baby is fretful and crying. The trainman approaches the mother in a sympathetic way, plainly indicating by his manner that he would like to be helpful if the mother could tell him how. She says the baby is hungry, but she has no way of warming its feeding bottle. "I believe I can have it warmed up," said the trainman. He went to the dining car, returning in a short time carrying the baby's bottle on a tray wrapped in a table napkin and handed it to the mother. The mother was grateful and offered the trainman a dollar bill. He declined the gift with thanks. "That is part of the service of the North Shore Line," he said simply, as he returned to his station on the platform of the car.

A significant point to that story is that it was neither the conductor nor the young mother who reported the incident. It was another woman passenger, a stranger to the mother and to the conductor, who wrote a letter to the editor of our company publication relating the story substantially as I have told it. She was so impressed that she felt she ought to commend the act of courtesy.

What has that story to do with the subject of this paper, "Educating the Public"? It has everything to do with it. The passenger who wrote that letter was given a more favorable impression of the company in five minutes than she would have obtained from reading newspaper advertisements every day for a year.

A traveling salesman boarded a train recently to go from Chicago to Milwaukee. It was early in the morning. He handed the conductor a mileage book and headed for the dining car. He ordered breakfast and when about to pay his check discovered that in his haste he had left his home without any money. He explained his position to the waiter. "That's all right, sir," said the waiter. "I'll pay the check and you can pay me on your next trip." The traveler did not wait for his next trip to pay that debt. He sent the amount—with something added—to that waiter immediately he reached home. The waiter proudly exhibited the letter he received. What impression did the traveler get of the company? It is safe to say that it was favorable and that he has told others about the incident.

One more incident and I am through with the human interest stories. A young man who works in Chicago and whose parents live in Milwaukee had spent the week-end with his folks. Returning, he had to take a train leaving at 5 o'clock in the morning. When about to purchase his ticket he discovered he did not have enough money in his pocket to pay the fare. He had friends in Milwaukee who would readily have cashed his check, but they were still abed. He bought a ticket to Racine, intending to get off there, get a check cashed and wait for a later train. He told the conductor of his dilemma. "I am not supposed to accept checks from strangers," said the conductor, "but I'll take a chance." The young man was very grateful. On reaching Chicago he wrote a letter to the editor of our company publication giving the details of the incident.

The thought may occur to you that these are isolated incidents and that the effect they have on the education of the public is infinitesimal, because the thousands of passengers daily carried on a railroad cannot be won over by such personal attention. The effect, however, is much greater than might be supposed at first glance, because it is cumulative. It is not alone the passenger receiving the attention that is favorably impressed. Others in the same car notice these things, they speak of them after leaving the car. When such incidents occur day after day, when they come to be recognized as a fixed policy of a company, such a company has traveled a long distance on the road to the education of the public.

I have dealt with only one phase of the education of the public; that is, "personalizing" a company through its employees. There are other phases on which my time does not permit discussion. I wish, however, to make one more point before concluding.

---

*Abstract of paper presented before the Illinois Electric Railways Association, Chicago, March 26-27, 1924.

Under public regulation the electric railway, or other utility company, has no secrets. Its cards are always on the table, face upward. Educational work should be directed toward driving home that fact. Where there is secrecy, there is sure to be more or less suspicion, and suspicion grows into distrust. Nothing is gained by withholding information about a public service company from its customers. I do not mean that it is necessary for a company to broadcast every intimate detail of its business. The public has no interest in such details. But the public is interested in a general way in the operation of a company that is supplying it with an essential service, and the more information of that character given the better it is for the company.

Every utility company wishes to have the confidence of its customers. It must therefore take its customers into its confidence, and by its fair and square dealing with them convince them that it really has a soul, a spirit of service.

Educating the Management*

By W. H. Sawyer

President East St. Louis & Suburban Railway

THE word "education" is a most misused word. We not only misuse the word itself but we use it in a sense which is detrimental to ourselves, to our associates, and to our business. I have heard many tell how we must educate the public, how we must educate our associates—wrong, all wrong. Who are we who are on such a high plane that we can educate all others? Education is all right, but education begins at home, begins with ourselves. It is not our business to educate others. We have no right to seek to educate others.

The only basis on which we have any right to educate others is in the sense that we have a right and a duty to impart information to others. But to teach them, train them, discipline them, tell them what they can do, what they must do, is not within our province. It would be far better to discuss the education of executives, of engineers, of transportation men, of publicity men. If properly educated ourselves we may then be able to impart knowledge to others which will be helpful to us and to them. The problem, therefore, is how best to educate ourselves, not how best to educate the public or our employees.

Due to lack of education we ourselves have been to blame for a large portion of the ills which have befallen the electric railway industry in the past. The electric railway man's duty is, first, to give service, efficient, satisfying service; second, to give the public, our customers, facts, all the facts regarding our business. The executive who is not following this plan today displays his lack of education, and is the one who needs to be educated.

In order that you will not misjudge my remarks I want to say now that the electric railway executive of 1924 has already acquired a considerable education and appreciates the fact that his education is not complete and that he must acquire a better education so that he may be better able to conduct his business. The great big majority of electric railway executives today are not trying to educate their public, because this is not their duty nor their right. What we are doing today, and doing far better than was ever done before, far better than any one even five years ago thought it was possible to do, is to give real service and real facts.

Doing these things as we are now doing them has brought about a most favorable reaction. Electric railways are as a result giving better service, carrying more people, and what is of most importance, our electric railways are in better repute, less criticised, and less open to criticism than ever before. Never before have we received the co-operation from the public that we are now receiving. We have a right to be proud of what has been accomplished. But what has brought about this result? Not the education of the public, but our own acquisition of education.

Our customers are entitled to the facts concerning our business. The best way to give these facts is through publicity in the advertising columns of the newspapers. If we follow this general plan we need not worry about the education of the public. All we need do is to follow along the trail blazed by Britton I. Budd, and then we will not have to meet and talk about the education of the public.

Now, just a word along similar lines regarding the education of our employees, our associates. All that I have said regarding the necessity of educating ourselves instead of the public applies equally well to the so-called education of our employees. We must meet our employees also from a 1924 standpoint. We must recognize that our employees, our associates, must have a pride in what they are doing and in what we are doing. We must recognize that they are our associates and part of our business. We need their co-operation, but we need not go out educating them. We, ourselves, must perform in such a way that we merit their confidence, and so that they appreciate that our interests are mutual, then we will receive their co-operation. They do not need education, but will fall into line when we conduct ourselves so it is easily recognized that it is to their interest to co-operate with us. We must be human, we must be fair, and we must recognize the part they play in this big industry of ours.

None of us have reached the point in our own education that we are in the best position to do all the things that we should do for our associates. It does us good to gather together like this and talk over the things which have been accomplished toward bringing about co-operation from our associates.

There is one little thing we have done down our way that has been very helpful in bringing about co-operation. Some years ago we had street cars that were swept at times and washed at times. We had motormen and conductors that were at times courteous and helpful to our customers, but a lot of the time things were not as they might have been. But those men were not to blame that their customers were not always treated courteously, because in the past we executives and operators were satisfied to give this kind of service. I did not try to educate these men but I tried to gain their co-operation, and I believe I am succeeding. I did not go out and damn them because the cars were not clean. I did not go out and damn them because they were not courteous and helpful to their customers (we never even called them customers in the old days, they were just people that rode street cars, rode street cars because they had to ride them).

Our first step was to get a true picture of just what we were doing. In order to do this I hired, so to speak, half a dozen people, whose work required their riding the cars a considerable portion of the time, to report to me what they saw when they rode our cars. I explained to these people what we were trying to do and then asked them to tell me if we were doing it. I asked them to pay particular attention and give me detailed information concerning those men who did something better than the average. If they saw a conductor or motorman do an especially courteous act I wanted them to be sure and tell me about it and give me all the details. Whenever I received a report of an especially courteous or helpful act I immediately wrote the conductor or motorman a personal letter, telling him of the report I had received and "as a slight token of my appreciation of his helpful attitude" I inclosed a $5 bill. The $5 did not buy that man; my writing him a commendatory letter did not change him from black to white, but it did do this—it let that man know I wanted to co-operate with him to give satisfying service, and it also let him know that I appreciated he was part of our big industry.

As time went along I kept telling the public about these courteous acts and about how these men were trying to be courteous, and about the pride I had in them for being courteous. We got to the point that I asked the public, invited the public, begged the public to tell me what they saw on the street cars. I told them I wanted criticisms if they had any, but I particularly wanted them to tell me whenever they saw any of our men doing something especially helpful. In the course of time I received a real response from our customers. I got to the point that I did not have to pay people to tell me of helpful acts; our customers did it voluntarily. Why? Because we were performing; because we were doing the things that bring about satisfying service, and because we were going to our public, our customers, and talking to them through newspaper advertisements telling them what we were doing, and what we were trying to do. That is why we got a response from them. They knew what we wanted to do; they knew that what we wanted to do was mutually helpful and were willing to co-operate with us.

---

*Abstract of a paper presented before the Illinois Electric Railways Association, Chicago, March 26-27, 1924.

About the same time that we started what some people would call a courtesy "campaign"—I never call any of them "campaigns," a campaign means something that you do for a short time—a whirlwind affair; we also took another hold of ourselves in regard to clean cars. We doubled the force in the car-washing shop; we washed our cars twice as often; we washed windows in between car washings, so we washed windows four times as often. We then put a broom on each car and asked the conductor or motorman to sweep the car at the end of the run. Of course they did not all do it right off; they were not used to sweeping out cars—some of them said they were not porters. We did not damn them if they did not do it, but whenever we found an especially clean car I wrote the man a letter and sent him a $5 bill. They commenced to have a pride in keeping their cars clean; they commenced to want to keep their cars clean. Of course, they do not now all keep their cars as clean as we would like to have them, but a lot of them do. One thing is sure—they are practically all doing a better job than they used to do.

Now these are two things, two small things, that we have done down our way to bring about better public relations and better employee relations. We have tried to more nearly satisfy our customers by cleaner cars and more courteous and more helpful platform men, and at the same time have materially increased the co-operation from our associates. This was brought about by the education of ourselves. There are many other little things that we have done down our way in which we have a real pride. Do not misunderstand me, we down our way are not educated; we still have a lot to learn, but until we more nearly perfect our own education we are not going to complain of the lack of education on the part of our customers or our associates.

Education for the North Shore Line Employee*

By C. G. Goodsell

Educational Director Chicago, North Shore & Milwaukee Railroad

In our educational program for employees of the Chicago, North Shore & Milwaukee Railroad we began with the laborer out on the right-of-way. This was in 1921, and as this work of teaching these men English, citizenship and trackwork began to attract attention the inquiry came from other employees as to why not educational work for them? A trainman inquired about an opportunity to learn to speak better English. Another wanted to know what he should study to be in readiness for some advancement. A merchandise dispatch agent asked about getting a better knowledge of freight traffic. In one department an official stated that not a foreman could make a rough shop drawing which would give one any conception of what he had in mind. Many other evidences indicated the need of a company-wide educational program.

It was about a year ago that the educational service of the road was finally extended to employees of all departments by the appointment of a new educational committee and the enlarging of the field of service of the educational director to cover the broader work. About this time a letter went out under the signature of Britton I. Budd, president of the road, encouraging the educational efforts of the employees and stating that the company would be glad to share the expense where any was incurred in pursuing courses which would better equip one for work with the road.

As a result of this indorsement of the educational movement by the management a great many employees began to think about the matter of education and many inquiries were received. In a few months 150 interviews had been held with the supervisory force and employees desiring more education and much valuable data relative to the needs of our employees was secured.

Immediately steps were taken to meet these needs through outside educational institutions or our own classes as the conditions warranted and as a result the following subjects have been studied by our employees during the year: Air brakes, arithmetic, acetylene welding, accounting, blue print reading, shop drawing, railway surveying, public speaking, English, electricity, freight traffic, freight car repair, foremanship, mechanical drawing, office management.

Short courses were conducted by the company in air brakes, blue print reading and shop drawing, English and public speaking. Private instruction has also been given in electricity, mathematics, sheet metal drafting and shop drawing. Arrangements were made last fall with the public evening schools in Milwaukee and Kenosha, Wis., for our employees to attend classes even though they were not residents of these cities. We also have students in evening classes at Northwestern University School of Commerce, Armour Institute and De Paul University in Chicago and a commercial business college at Waukegan, Ill. Home study courses are being taken by a few of our employees through the Railway Educational Bureau of Omaha, the Milwaukee School of Engineering, LaSalle Extension University and others. Over 200 employees have been enrolled in our own classes during the year and about seventy enrolled in outside institutions.

An experiment in educational clubs is being made which looks attractive. A track foreman's club, an office boys' club and a public speaking club have been tried so far. Some difficulties enter into the problem in the case of the boys' club, but the two others indicate that more educational clubs may prove a successful part of our program.

We hardly need say that the easiest part of this educational program is the enrollment of the students. The real work comes in keeping the man "at it" until he has completed something. As you know, over 90 per cent of those enrolling in correspondence school courses in this country never complete them and our crowded city evening schools usually find they have plenty of room for more students after a few weeks of hard work. This is no argument for abandoning the task, however; it simply means that the average man is naturally a "quitter" and that he needs help. It means that some one is needed on the job for the express purpose of helping the average man get the education he needs for the job he is holding or for the better one ahead.

Most of the programs laid out for the education of the man in industry are not attractive enough to hold him. The work is often not elementary enough for the average and usually the courses cover so long a period that he is discouraged before he starts. We have often heard officials say, "If the man hasn't the stuff in him to stick to a course of study and complete it, let him go. I stuck and I didn't have half the chance this fellow has had." Now, as a matter of fact, we have no business "letting him go." It's the average man that makes up the great army of our employees, and when we let him go we simply say we are going to cripple along with an inefficient, untrained force and a high labor turnover. Better say, "We'll find the difficulty and remedy it." Too little time and thought has been spent on this problem.

Some one has said, "Carter's Little Liver Pills never would have had half the sale if they had been Carter's Big Liver Pills." So it is with education. Small doses, and if necessary sugar-coated, will get results never secured from long courses offered in an unattractive form. But I hear some one say that a short course does not amount to shucks. I differ absolutely with that statement. A short course does amount to a great deal. In the first place even one hour a week for ten weeks may put a man on the road to bigger and better things if the right kind of a man is teaching him. It gets a man out of his rut. He begins to get a vision of the things beyond. He begins to feel the joy of mastering something. If the course is a practical one, as it usually should be, each lesson gives him something which he sees will come in handy on his present job or the job ahead. It often is the means of getting him interested enough to dig up the technical books he has stowed away at home and make them a live source of information. It literally takes that man out of the class of the "standstills" and puts him in the "go aheads."

There is another effect also which should not be overlooked. That man immediately begins to think a little more of himself, to stand a little straighter, to feel a little more as though life was worth living. You show me a bunch of men in your employ who are studying some practical subject together, no matter how simple or short the course may be, and I'll show you a bunch of men who are making for a better spirit; they'll be boosters rather than knockers.

---

*Paper presented before the Illinois Electric Railways Association, Chicago, March 26-27, 1924.

We are now working on short courses to be offered on our property which will be so related to each other that a man may take a single short course in blue print reading, shop drawing, shop arithmetic, air brakes, principles of electricity, car wiring, electrical signals, motors, etc., or he may take a combination of several of these subjects, using two or three nights a week, so that he will in the course of time have a large amount of technical knowledge which will apply to conditions as they exist on our property.

This will be, we believe, training of a grade within the reach of the average man. The man with a very limited education and only ordinary perseverance but able to give good service may develop into a valuable man to the company and a better provider for his family.

New England Club Has Usual Rousing Annual

NEARLY five hundred attended the annual banquet of the New England Street Railway Club at the Copley Plaza Hotel, Boston, March 27. As is customary at this meeting, the only business transacted is the election of officers late in the afternoon. The evening banquet is given over entirely to prominent speakers from outside the railway field. This year the club was particularly favored. Those who accepted places on the program were the United States Senator from New Hampshire, the Governor of Massachusetts and the Mayor of Boston.

President Ralph D. Hood delivered a brief address on the activities of the club, which has had one of its most active years, then introduced former Massachusetts State Senator Robert M. Washburn, who acted as toastmaster and certainly made the most of his opportunities.

United States Senator George H. Moses spoke briefly on the spirit of suspicion and innuendo which obsesses Washington at the present time. As chairman of two investigating committees and a member of a third, he commented that he thought he could speak with authority on the low character of some of the testimony that has been taken in these investigations. Incidentally, the toastmaster made a good deal of humor at the expense of the Senator on the character of the testimony and the personnel of the investigating committees, which the Senator seemed thoroughly to enjoy.

The Senator spoke pointedly about the tax situation. He said that six states pay 62 per cent of the entire burden of the federal government, and that obviously all representatives of the less populous states vigorously oppose any measure that would tend to bring about a more equitable distribution of the taxes. He said the dollar-for-dollar plan of building roads, whereby the federal government contributes a dollar for each dollar the state puts in, looks upon its face to be very meritorious. Actually, however, it means that the six heavily taxed states pay a large share in the road programs of other states. As he put it, it makes the progressive states pay for the backward ones. For example, New Hampshire pays a federal tax of $23 per capita, but on the dollar-for-dollar program it gets back 89 cents in federal money, and in order to get that it has to tax itself practically another 89 cents. Another state which draws $3.25 per capita of the federal funds pays $8,000,000 less than does New Hampshire, and another draws $1.86 and pays only one-half the federal tax that New Hampshire does.

ALL ABOARD!
COPLEY PLAZA
ANNUAL BANQUET
N.E. ST. RY. CLUB
COPLEY PLAZA
MARCH 27, 1924

Governor Channing H. Cox made a brief but stirring speech to the effect that our republic, with all its faults, is the most glorious success of any form of government that has ever been set up.

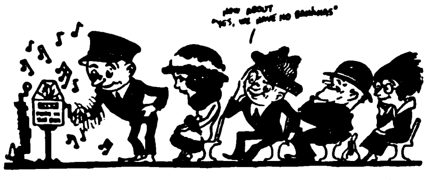
Mayor James M. Curley had to disappoint the convention at the last minute, but he was ably represented by Mark Sullivan, who extended the welcome of the city. The last speaker on the program was the Rev. William Porter Niles, essayist.

NEW OFFICERS ELECTED

The following officers were elected for the ensuing year:

President, T. H. Kendrigan, superintendent and claim agent Manchester Street Railway, Manchester, N. H.

Vice-presidents: For Massachusetts, L. D. Pellissier, Holyoke; Connecticut, J. K. Punderford, New Haven; New Hampshire, L. E. Lynde, Dover; Vermont, T. B. Jones, Burlington; Maine, Fred R. Gordon, Portland; Rhode Island, Edward A. Brown, Newport.


HOW ABOUT "YES, WE HAVE NO BANANAS"

Suggestion 2,396,453. A music box attached to the "coin catcher" to keep the cash customers contented.

Secretary: John W. Belling, Boston, Mass.

Treasurer: Fred F. Stockwell, Cambridge, Mass.

Executive Committee: Ralph D. Hood, Charles H. Wood, W. W. Field, Howard F. Fritch, George H. Martin, George H. McFee and H. M. Flanders.

Southwestern to Have Good Railway Program

THE Southwestern Public Service Association will hold its annual convention at New Orleans, La., on April 22-25, at the Roosevelt Hotel. The program this year contains an unusual number of papers and discussions of interest to electric railway men. The program also comprises sessions and subjects for the gas and electric men. Of particular interest to the railway men are the following items on the program:

TUESDAY MORNING

"Prone Pressure Method of Resuscitation," by Samuel H. Reid, Bureau of Safety, Chicago.

WEDNESDAY MORNING

"Why Street Car Rides Vary Widely in Cost in Different Cities," by J. W. Welsh, executive secretary American Electric Railway Association, New York.

"Proper Financial Structure of a Public Utility Company," by W. C. Lang, assistant comptroller Electric Bond & Share Company, New York.

WEDNESDAY AFTERNOON

"The Relations of the American Electric Railway Association to the Regional Association," by J. W. Welsh, executive secretary American Electric Railway Association.

"Operation and Maintenance as Basis of Public Relations," by A. B. Paterson, vice-president New Orleans Public Service, Inc.

"Education and Development of Employees with Reference to an Understanding of the Fundamentals of the Railway Business," by G. H. Clifford, vice-president Northern Texas Traction Company, Fort Worth.

THURSDAY MORNING

"The Street Railways and the Public," by W. H. Sawyer, president East St. Louis & Suburban Railway, East St. Louis, Ill.

"Employee Training for Better Public Relations," by S. M. Kennedy, vice-president Southern California Edison Company, Los Angeles.

"A Giant Awakened," by Alexander Forward, secretary-manager American Gas Association, New York.

THURSDAY AFTERNOON

Transportation Division

"Training of Inspectors," by W. W. Holden, superintendent of transportation San Antonio Public Service Company.

"Schedule Making and Organization of the Schedule Department," by T. H. Owens, Dallas Railway.

"The Relation of Types of Cars to Character of Service," by R. Meriwether, general manager Dallas Railway.

"Accident Prevention," by W. A. Robertson, superintendent of railways, Eastern Texas Electric Company.

Public Relations Division

"Railway Advertising," by C. J. Crampton, Dallas Railway.

"Participation in Public Activities," by W. E. Wood, manager Houston Electric Company.

Mechanical Division

"Use of Electric and Acetylene Welding in Shops," by Walter Silvus, Texas Electric Railway, Dallas.

"Shop Organization and Practice in Connection with Maintenance and Extension of

Equipment," by V. W. Berry, general superintendent Northern Texas Traction Company, Fort Worth.

"Rapid Wear of Carbon Brushes on Ventilated Motors," by F. J. Bennett, Houston Electric Company.

Maintenance of Way Division

"Various Types of Track Construction with Reference to Costs of Paving," by R. G. Tabor, Northern Texas Traction Company, Fort Worth.

"Types of Joints and Methods of Installation," by G. W. Smith, San Antonio Public Service Company; R. B. Fehr, Rail Welding & Bonding Company, Cleveland, and others.

"Creosoting and Other Methods of Preserving Ties and Poles," by E. E. Boehme, International Creosote & Construction Company; J. P. Logan, National Lumber & Creosote Company, and others.

"Cast Steel and Alloy Steel vs. Manganese for Special Work," by E. B. Ledwisle, Lorain Steel Company; James H. Budd, Bethlehem Steel Company, and others.

"Crossings—Type, Paving and Foundation," by B. H. Taylor, Houston Electric Company.

Accounting Division

"Use of Machines in Accounting Work," by F. J. Gannon, assistant treasurer Northern Texas Traction Company, Fort Worth.

"Obtaining Car Mileage," by W. R. Burns, Dallas Railway.

"Transportation Pay Roll Accounting," by A. D. Dufour, New Orleans Public Service, Inc.

FRIDAY MORNING

"Building in the Public Mind the True Conception of Utilities," by E. F. Wickwire, vice-president Ohio Brass Company, Mansfield, Ohio.

"Relation of Bus Operation to Street Railways and the Outlook for the Future," by W. B. Tuttle, president San Antonio Public Service Company.

"Methods Employed for Elimination of Car Pull-Ins and Relation to Service," by R. M. O'Brien, New Orleans.

American Association News

Legislative Activities in Washington

American Association Committee on National Relations Busy Presenting Point of View of Electric Lines on Three New Bills—Suggestions Made for Guidance of I. C. C. on Application of Section 15a

THE committee on national relations of the American Electric Railway Association made an appearance at a hearing on March 29 before the Senate interstate commerce committee on the Howell railway labor bill, S. 2646. In a word, this bill provides that the present wages and present working conditions shall continue in effect. If a revision is desired, thirty days' notice must be given to one of the several boards that would be set up by the bill, and can be made only upon approval by this board. The electric railways are specifically included in the bill and its effect would be to bring adjustments under a national board. It might result in forcing electric railway employees into the steam railroad brotherhoods.

Charles L. Henry, chairman of the national relations committee; Frank Karr, Pacific Electric Company; R. R. Bradley, Chicago, North Shore & Milwaukee Railroad, and W. V. Hill, San Francisco, appeared for the electric railways. A short but specific statement setting forth the position of the electric railways with respect to such a proposal was presented by Mr. Karr. Just after he concluded, D. R. Richberg, counsel for the organized steam railroad employees, addressed the Senate committee and said that the proponents of this bill did not desire that the electric railways should be included, if such railways and their employees did not so desire; that in the light of former legislation they had concluded that it was proper to put the electric railways in, but the latter might be removed from the bill without any opposition on the part of those pressing this bill for passage.

HEARING ON STEEL CAR PROPOSAL

Representatives of the association made an appearance in Washington on March 20 before the Senate interstate commerce committee on the proposed Dennison bill, H. R. 4107. The Dennison bill is known as one "for the protection of persons employed on railway baggage cars and railway express cars." It has been substituted in the House for Senate bill S. 863. It provides that carriers, specifically including interurban and suburban railway companies irrespective of whether steam or electrically operated, shall use only baggage and express cars after July 1, 1926, which are constructed of steel or have a steel underframe, and that after this date all new cars must be constructed of steel, subject to the approval of the Interstate Commerce Commission.

The bill is designed primarily to apply to steam carriers, but the committee on national relations felt that the electric railways should appear and point out that the conditions it was sought to correct did not exist in the electric railway field. At the hearing Charles L. Henry made a short statement for the electric railways and introduced H. A. Mitchell, vice-president and general manager San Francisco-Sacramento Railroad, Oakland, Cal., who made a statement. Others in attendance representing electric railways were Frank Karr, San Francisco; E. H. Maggard, Petaluma, Cal., and W. V. Hill, San Francisco. The committee finally indicated that the proposition to require all steel cars in baggage and express service would be confined to Class A steam roads, and main line service in particular.

ANOTHER SIMILAR BILL INTRODUCED

While it appears that the House bill referred to above will not affect the electric lines, another bill, S. 1499, has been reported to the Senate without a hearing in committee, which involves the electric railways. This bill passed the Senate with but slight opposition on March 28. It prohibits the use of wooden cars. Senator Harris, its author, was asked by Senator King whether it would prohibit the operation of wooden cars on interurbans. Senator Harris replied that it would not, but in answer to another question he stated it would not permit electric lines to use wooden cars between steel cars. This would prohibit electric lines from operating a wooden car in the same train with a steel or a steel underframe car.

RULES SUGGESTED AS TO APPLICATION OF SECTION 15A

At the close of the hearing on March 19 before the Interstate Commerce Commission in Washington on whether Section 15a of the interstate commerce act should be applied to interurban railways (see ELECTRIC RAILWAY JOURNAL for March 29, page 511) Commissioner Potter requested J. V. Norman, counsel for the Interstate Public Service Company, to endeavor to obtain the approval of as large a number of the interested parties as possible to general rules which would automatically place many carriers without Section 15a. The idea was that such rules would relieve the commission from the individual consideration of many carriers. During the hearing Mr. Norman had proposed certain rules in his testimony. He stated that these rules were to be considered as general rules which would exclude from further consideration a large number of companies, but that it was not to be understood that companies not excluded thereby were inferentially within the act.

After the hearing was concluded, a meeting was held of all present and there was a long discussion of rules that might be proposed. All those present agreed on Rule 1, as stated below, as a proper one, but many of them were unwilling to subscribe to it as a proposal coming from the electric roads for fear that the commission might receive the impression that the companies not excluded by the application of the rule were inferentially within the provisions of the act.

No agreement whatever could be reached on a proposed second rule, as stated below, principally because the meeting could not agree on the phraseology, but also because such a rule might be so applied as to exclude from the operation of the act some companies which desired to come within its operation.

The two rules discussed were as follows:

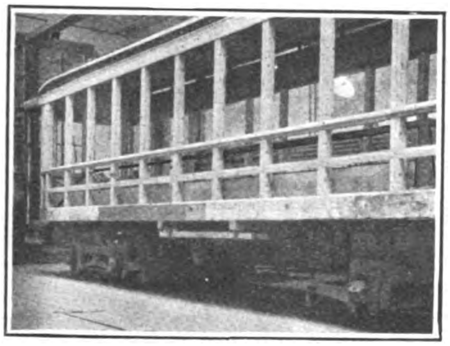
> Rule 1. No electric interurban railway is "engaged in the general transportation of freight" within the language of Section 15a unless it exchanges freight traffic with steam carriers under through routes and joint rates.
>
> Rule 2. An electric interurban railway which interchanges freight traffic with steam carriers, as provided in Rule 1 above, is not within the provision of Section 15a unless it holds itself out to handle the same general classes of freight in the same general manner as steam carriers.

In view of the considerations already stated, the meeting decided not to propose any rules to the commission, but authorized Mr. Norman to convey to it the information that while all agreed that Rule 1 is a proper rule they were unwilling to propose it for the reasons stated above.

Maintenance of Equipment

Truss Braces Rebuilt Car

AN UNUSUAL method of bracing the car body has been adopted by the Holyoke Street Railway in rebuilding for passenger service a mail car which formerly operated between Northampton and Springfield. Two triangular iron castings are used on each side as vertical compression members of a truss, with a steel strip as the tension member. One casting is placed beside the second window post from each end of the car. A steel strip ⅜ in. thick and 1½ in. wide is fastened beneath the frame at the corner post and runs up over one triangular support, continues parallel to the floor of the car, then over a similar support at the opposite end, and down under the other platform floor. Two trusses of this sort are used in this reconstruction, one on each side of the car.



A Truss on Each Side of the Car Prevents Platforms Sagging

New Platforms Added to Old Cars

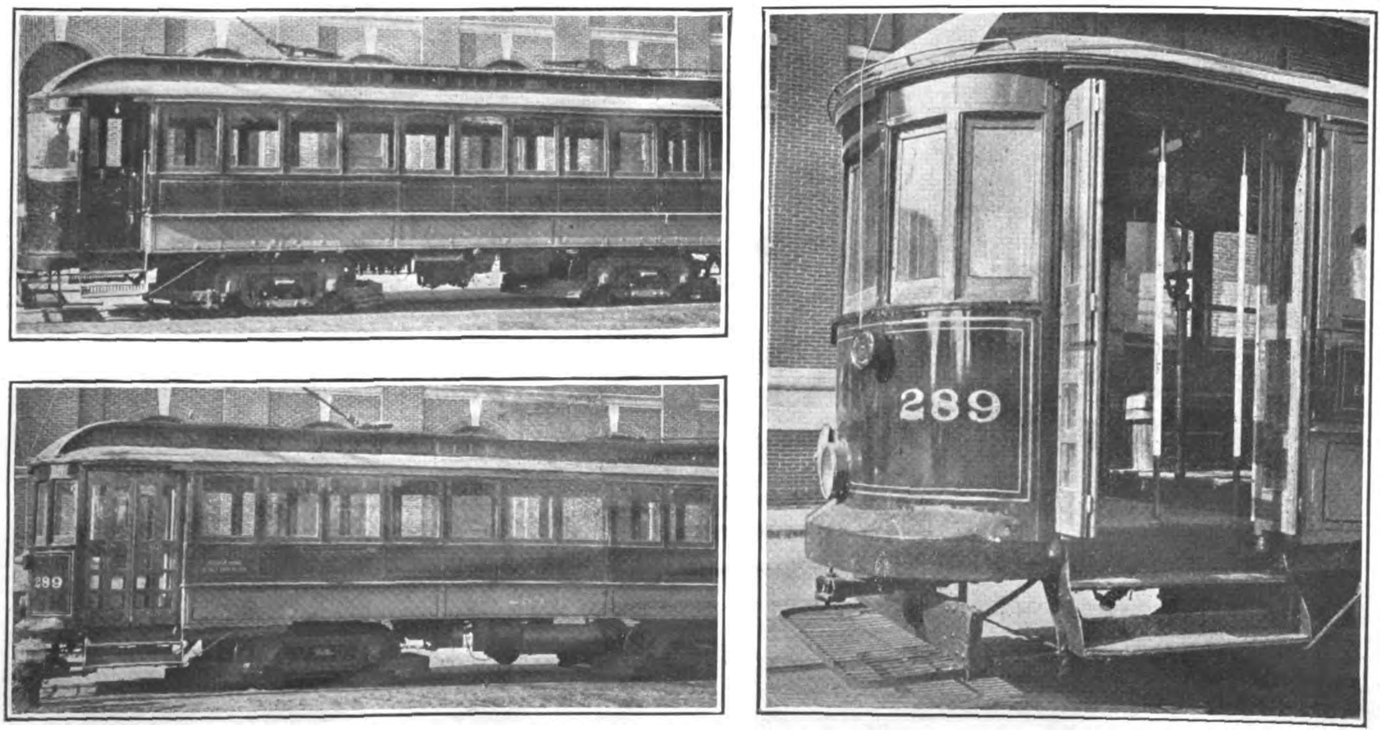
IN THE conversion of some of its older cars to the prepayment type the Union Street Railway, New Bedford, Mass., has extended the car platforms. This was done by making a clean transverse cut at the bulkhead and removing the platform. The old platform and dash were used again in the rebuilt car, an 18-in. section being inserted at the bulkhead. The platform knees on these cars are of wood, reinforced on either side by steel plates. Extensions to the plates were bolted on and an 18-in. wood block inserted to fill the hole.

The end bulkheads were taken out to facilitate the use of the prepayment plan on this type of car. Convenient grab handles were placed in the center of the double doorway and at both sides. These are located inside the folding doors so as to discourage passengers attempting to board the car after the doors have been closed. The doors are manually operated, but are interlocked with a line switch in the main motor circuit. Another safety feature which was introduced when the cars were rebuilt was the use of sloping steel hoods on the end bumpers.

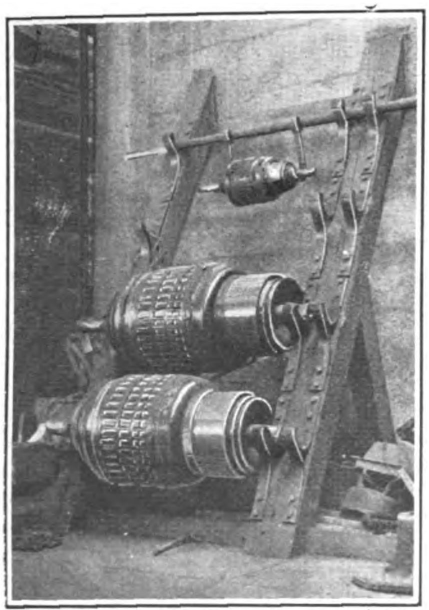
The weight of these cars was slightly less than 19 tons before rebuilding. The reconstruction added only a small amount to the weight. A modern type car has been acquired at approximately 10 per cent of the sum that new cars would have cost.

Handy Method for Supporting Short Armatures

WHERE armature racks are constructed for supporting railway motor armatures, which are all of approximately the same length, difficulty is sometimes experienced in providing supports for short armatures such as those for compressor motors. The accompanying illustra-



An 18-In. Section Was Added to the Platform to Fit New Bedford Car for Use on the Prepayment Plan. At Right, Enameled Stanchions Placed to Aid Ingress and Egress and Divide Passenger Streams

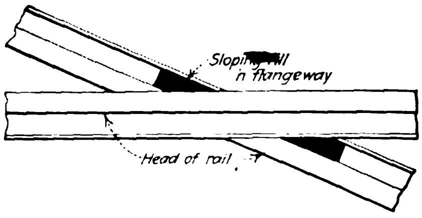


Built-In Armature Rack with Provisions for Supporting Short Armatures

tion shows an armature rack in the shops of the Philadelphia & Western Railway, Norristown, Pa. At the top is a short armature which is supported by hooks from a shaft extending over the supports ordinarily used for the longer armature shafts. By this method the short armatures can be stored in the rack where the larger type armatures from railway motors are placed.

Special Crossover Preserves Continuous Through-Rail

AN UNUSUAL type of crossover has been made by the Springfield Street Railway, Springfield, Mass., for use in front of its carhouse at Main and Carew Streets. It is frequently desired to cross cars over from one track to the other at this point, but there is also through service on a comparatively short headway and it was thought undesirable to break the through-rail. To meet this situation a special crossover was made by the track department. The main line rail was left continuous and the crossing rail was welded to it. Grooved rail was used in both cases and a sloping fill was welded into the flangeway of the broken rail in order to facilitate the passage of wheels over the continuous rail.



The Sloping Fill of Welding Metal Facilitates the Passage of Wheels Over the Continuous Rail of This Home-Made Frog

Painted Paths Promote Safety

IN THE shops of the Worcester Consolidated Street Railway, Worcester, Mass., an overhead monorail system equipped with chain hoists is used for transporting heavy material. This was described in the JOURNAL for March 22. The routes by which this material is moved are therefore definitely established, and have been marked out on the floor. A broad white stripe on each side indicates the limits of the passageway which must be kept clear for the movement of material. Nothing is permitted to be stored in this area. The passageway is also available for individuals walking from one place to another, movement of material in hand trucks, etc. The white lines are repainted about once every two weeks so that they are always distinct.

It has been found that the cost of thus marking the passageways has been more than repaid by reduction in the number of accidents due to persons, or material in transit, colliding with material stored on the floor.

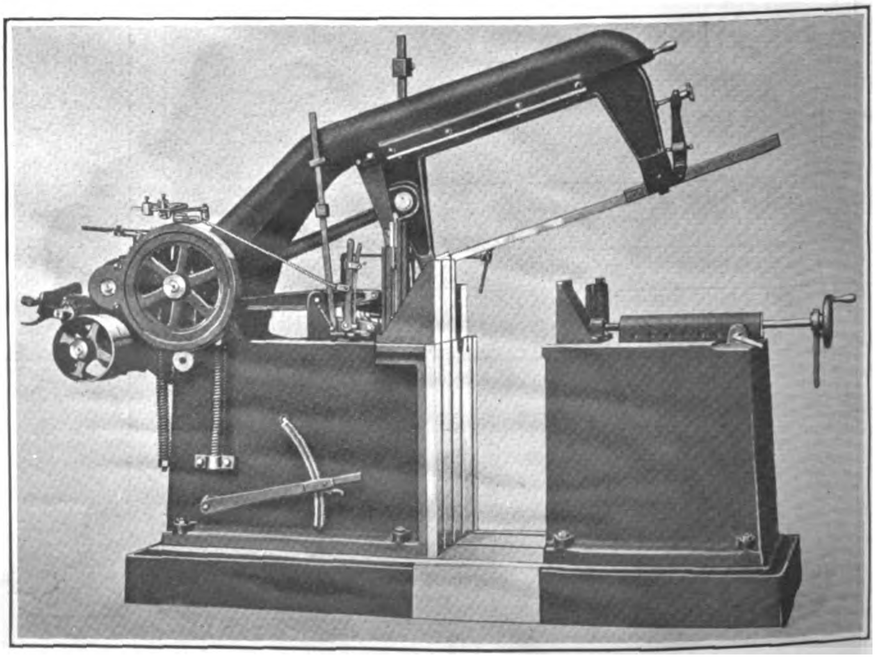
New Equipment Available

Power Hack Saw with Gap

A NEW type of power hack-saw, which the manufacturer calls a "Gap-Saw," has just been announced by the Peerless Machine Company, Racine, Wis. As in the case of a gap-lathe, when the gap is closed the saw can be used for ordinary purposes. When the gap is open, it has an excess work holding capacity of 24 in. in height and 16 in. in width.

The work can either be clamped to the finished vertical face on the bed, where four "T" slots are provided for clamping purposes, or the work can be clamped directly to the base, where three "T" slots will give ample clamping convenience. The base has a water-trough extending entirely around its perimeter, which carries the coolant back into a reservoir located in the rear of the base, from where a rotary geared pump circulates the coolant up into the distributing pipe. The finished pad which is opposite the gap and which is located on each side of the base is for the convenience of the operator when locating work which is clamped directly to the base. The left-hand edge of the bed is also finished for measuring convenience purposes.

A piece of steel 16 in. x 26 in. can be sawed in two by sawing through 13 in. and then meeting the cut by



Power Hack Saw with Gap Open

GENERAL SPECIFICATIONS FOR POWER HACK SAW

Capacity of machine on ordinary work	13 in. x 16 in.
Capacity of gap-work	16 in. x 37 in.
Length of blade	14 in. to 24 in.
Length of machine	80 in.
Width of machine	30 in.
Weight of machine, approx.	3,000 lb.
Distance from floor to top of base	6 in.
Distance from floor to top of table	30 in.
Strokes per minute of saw frame	125

---

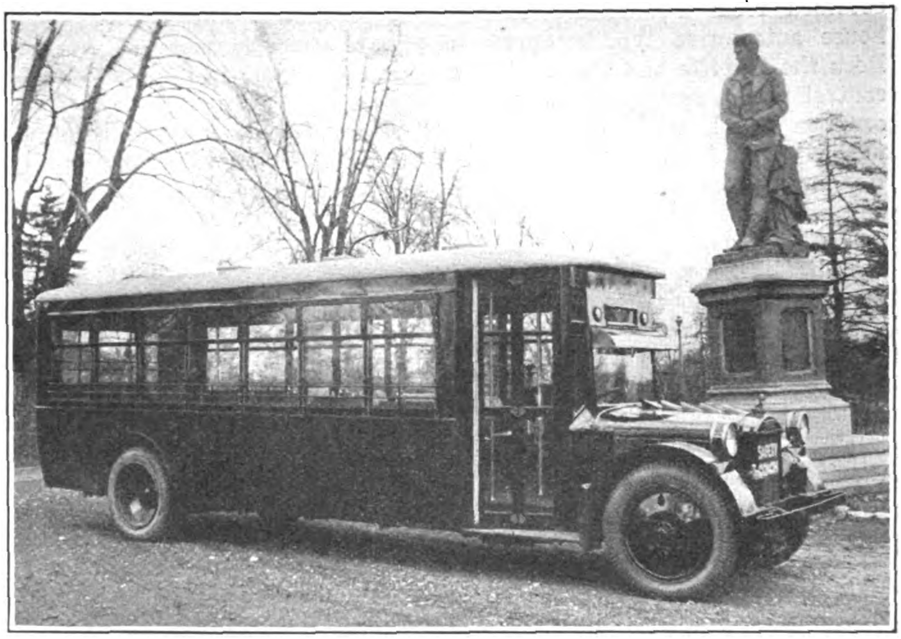
turning the piece half way over. This work is often encountered in the railroad shop, the drop-forge shop and the structural steel yards. Often hammered forgings such as are machined up into crank-shafts can be blocked out prior to the machining operations.

The head lifts up on each return stroke and when the blade comes to the bottom of the cut, the feed is automatically disengaged and the head lifted up to its uppermost position through balance springs. Blade pressure or feed can also be varied at will by raising or lowering the ratchet lever shown on the side of the head.

The machine shown in the cut is equipped with the standard six-speed stroke mechanism which is used on the Peerless high-speed saws when the materials require different cutting speeds. Either this attachment or the usual 2-hp. motor, or both, can be furnished with the machine. The machine can also be furnished without the six-speed gear box or motor and bracket.

Birney Safety Buses Exhibited at St. Louis

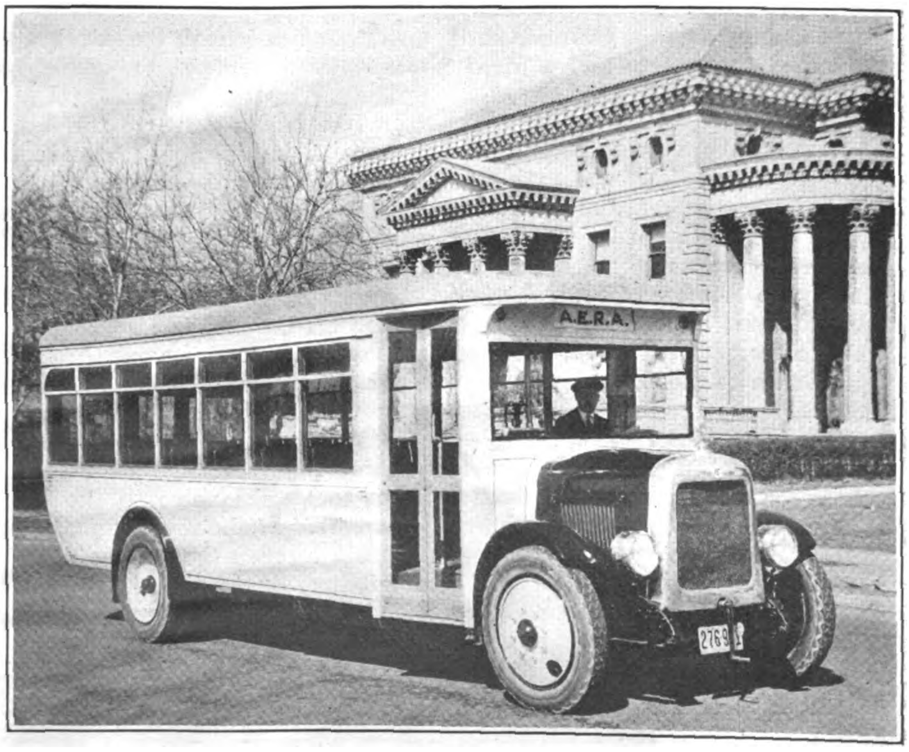
TWO buses designed particularly to meet the needs of electric railways were exhibited at the recent meeting of the American Electric Railway Association at St. Louis. Working on the principle that the safety devices which have been so successfully used on one-man street cars are even more desirable on a one-man bus which has to be maneuvered through vehicular traffic, and that any device which will relieve the operator of some of his duties will increase the safety of operation, an interesting arrangement of pneumatic safety devices and auxiliary apparatus has been developed. This work is the result of a study of bus operation by the bus committee of the Stone & Webster properties, of which C. O. Birney is designing engineer, working in co-operation with the Westinghouse Traction Brake Company, St. Louis Pneumatic Devices Company, American Car Company, St. Louis Car Company, Fageol Motors Company and the Yellow Coach Manufacturing Company.


Birney Design Body Built by American Car Company on Fageol Chassis

One of the buses has a body constructed by the St. Louis Car Company, mounted on a Yellow Coach chassis, while the other has a body built by the American Car Company, mounted on a Fageol chassis. Low hung chassis and pleasing lines feature both vehicles. The low step heights, together with liberal aisle space, insure convenient and rapid interchange of passengers in city service. Each bus has a seating capacity of 29. The body constructed by the American Car Company has a combination of cross and longitudinal seats upholstered in leather, the longitudinal seats being used over the rear wheel housings adjacent to the service door at the front. In the St. Louis body the cross-seat arrangement is used throughout and the seats are upholstered in green frieze plush.

COMBINED ACCELERATOR AND BRAKE CONTROL

Compressed air for the brake system and the pneumatic devices is



Birney Design Body Built by St. Louis Car Company on Yellow Coach Chassis obtained from a 3-cu.ft. Westinghouse automotive type compressor. Both the throttle and the air brake control valves are operated from a common pedal, which, when it is pushed down from the neutral position, opens the carburetor throttle, and when it is released tilts up beyond the neutral position to operate the air brake valve. The neutral position is clearly defined by a compound spring arrangement which is installed to facilitate the shifting of gears.

On the side of the foot pedal is a latch so that it can be depressed by the foot of the operator to engage a notch in the supporting casting and hold the pedal in full brake application position after this position has been reached. This latch controls the emergency or "deadman" feature of the device. If the pedal is released from any position less than full service brake application position, it immediately springs beyond the point where the latch will engage in its notch to a position in which not only a full service brake application is made, but also the engine throttle is closed to idling position and the air-operated service door is balanced so that it can be pushed open by hand.

Graduated control of the air brake is obtained by the use of an automatic lap valve with a reducing action which gives a predetermined brake application pressure for any given position of the brake valve. In any intermediate position, a constant brake chamber pressure is retained corresponding to this position, until the valve is moved to give a higher or lower pressure.

ARRANGEMENT OF PNEUMATIC CONTROL

A reservoir pressure of 75 lb. per square inch is carried. Two pipes lead from the main reservoir, one directly to the brake control valve and another to a reducing valve which allows a pressure of 50 lb. per square inch to the door control valve mounted on the steering wheel column. The brake valve controlled from the foot pedal allows air to flow to the brake chambers in graduated amounts as the pedal is allowed to tilt above the neutral position, and conversely, as the pedal is depressed from full brake application position, the brake chamber pressure is gradually reduced to zero. At the neutral position the brake chamber pressure is completely released, in which position the brake control valve connects the brake chamber pipe to atmosphere.

A center port in the upper portion of the brake valve body is connected directly to the door closing port of the door control valve on the steering wheel column. In all positions of the brake valve between neutral and full brake application position this port registers with a pipe leading directly to the door closing side of the door engine, allowing air to be transmitted through the reducing valve to the door control valve, thence to the center port of the brake valve and from there to the door closing side of the engine.

In the "deadman" or emergency position of the treadle the air connection through the brake valve is cut off and the door closing side of the door engine is vented directly to atmosphere, thus allowing the door to be pushed open by hand in the same way as is accomplished on the Birney safety car when an emergency application of the air brakes takes place.

GENERAL DIMENSIONS

Birney Safety Buses

Body	American	St. Louis
Chassis	Fageol	Yellow Coach "2"
Wheelbase	218 in.	193½ in.
Length over all	26 ft., 2 9/16 in.	25 ft., 1 in.
Length over body corner posts	18 ft., 10¾ in.	21 ft., 0 in.
Width at belt rail	7 ft., 6 in.	7 ft., 6 in.
Width at side sills	6 ft., 0½ in.	6 ft., 8 in.
Height from road over roof	9 ft., 0 in. (over ventilators	8 ft., 10 in.
Height from road to top of floor	1 ft., 10 in. at door 2 ft., 3 in. rear end	2 ft., 2⅞ in.
Height from floor to headlining in center		6 ft., 3⅝ in.
Height from floor to window sill	1 ft., 11½ in.	2 ft., 1¾ in.
Seating capacity	29 passengers	29 passengers
Seat centers	2 ft., 5 in.	2 ft., 5 in.
Post centers	2 ft., 5 in.	2 ft., 5 in.
Aisle width at cushion	1 ft., 8 in.	1 ft., 8 in.
Service door opening in clear	1 ft., 11 in.	2 ft., 3½ in.
Height from road to step	1 ft., 3 in.	1 ft., 4 in.

The air in the brake control pipe from the brake valve to the brake chambers passes through an automatic three-way valve before it reaches the chambers. The door opening pipe leading from the door control valve on the steering column is connected to the door opening side of the engine and is also continued through a tee to this same three-way valve. A sliding check in the three-way valve, in its normal position, closes the port leading from the door opening pipe and allows air to flow from the brake valve to the brake chambers. If, however, an attempt is made to open the service door by admitting air to the door opening side of the engine before a full brake application is made, the pressure immediately forces over the slide in the three-way valve and allows air to flow directly to the brake chambers, thus applying the brakes.

An additional port is provided in the upper portion of the brake valve to which pressure is admitted in the emergency position. This port is available for operating any auxiliary pressure device on the vehicle which it may be desirable to bring into action when an emergency application occurs. If not required, this additional port can be plugged so as to be inoperative.

PNEUMATICALLY OPERATED FARE BOX

Each bus is equipped with a Johnson fare box, which is mounted on the vertical stanchion immediately to the right of the driver. An extremely simple four-cylinder pneumatic engine, mounted in an aluminum case fastened to the bottom of the box, drives the registering mechanism by a light chain inclosed in an aluminum housing on the side of the box. This engine was developed by the St. Louis Pneumatic Devices Company and the arrangement is such that the entire box with its driving mechanism can readily be removed from the supporting stanchion. When this is done the air connections are automatically broken, and are likewise automatically remade when the box is replaced in its socket.

The design and construction of both bus bodies is very similar to that of the single-truck Birney type of one-man safety car. Continuous tee-posts are used for the side posts and roof supports, and many other features of the body structure are likewise similar to the construction used in the Birney car. In the American body wood lower side sash reinforced with brass wearing channels are used, while the St. Louis body is equipped with Curtain Supply Company's brass sash. The general dimensions of the two buses are shown in the accompanying tabulation.

The News of the Industry

Everett Results Disappointing

$14,780 Deficit in 1923 There Under Five-Cent Fare with Bus Operation

Everett, Wash., a city of 30,000, in which the local railway, the Pacific Northwest Traction Company, substituted buses for street cars except for one 5-mile line, is going to lose its 5-cent fare. After a long conference between city officials and officers of the railway, the proposed discontinuance of transfers on the company's bus lines has been averted by an increase in fare from 5 cents to 6¼ cents.

TROUBLE DATES BACK TO 1917

Sentiment against abolition of transfers arose at a conference attended by representatives of various civic bodies and George Newell, local manager of the company at Everett, agreed to withdraw his application to the Department of Public Works for this permit. Mr. Newell explained that the company automatically reverts to the 6¼-cent fare on April 1, and that the 5-cent fare, which has prevailed for sixteen months, had been merely the result of an agreement between the old City Council and the traction company for an experimental period.

The trials of the railway at Everett date back to 1917. Cost really reached the highest point in June, 1920. The railway was obliged to raise the pay of employees and at the beginning of 1921 employees were receiving considerably above 100 per cent more wages than before the war.

But that is only part of the story. Early in 1922 the company was confronted with additional problems in the way of rebuilding tracks and paving streets, and with an expenditure of between $3,000,000 and $4,000,000 in the next five years. As it could see no way of raising this amount or of earning a return on it the company decided to take its problems up with the City Commissioners with a view to working out a system of city transportation that would be adequate and that it could finance. As a result the bus was substituted for the railway.

FIVE-CENT FARE AN EXPERIMENT

During the negotiations with the City Commissioners for an amended franchise, the matter of fares was discussed and the commissioners were of the opinion that the company should try out a 5-cent fare with transfer privileges. The company agreed to give the 5-cent fare a fair trial in the hope that revenues might be sufficient to operate the system. That fare went into effect on Dec. 1, 1922.

The result was disappointing, however, for the company took in $6,450 less in 1923 with a 5-cent fare in effect than it did in 1922 when 6¼ cents was the rate for eleven months and 5 cents the rate for one month. On the other hand, expenses increased $19,020, not including depreciation on the buses. Including depreciation on the buses, expenses increased $34,573. When books were closed for the year the company lacked $3,180 of funds sufficient to pay operating expenses, depreciation on the buses and taxes, and money had to be borrowed with which to pay taxes. The deficit for the year 1923, including a reasonable depreciation on the remaining track and electric cars and other operating property in connection with the system, was $14,780.

Still further to aggravate this situation, gasoline took a sharp advance and city operators demanded higher pay. Finally an arbitration board granted the men a substantial increase in pay and recommended the company to the mercy of its citizens and car riders. This, however, placed the company in the position of having to carry out the award without sufficient funds to do so. The concern of the company was to pay legitimate expenses and give the stockholders, who have not received any dividends for the past nine years, some little return on the money invested.

COMPANY ASKS ONLY A SQUARE DEAL

About Jan. 20 there was filed with the department of public works at Olympia a temporary tariff extending the 5-cent fare until March 31 of this year. The company never withdrew regular tariff No. 6, under which it collected the 6¼-cent fare, but simply filed an experimental supplementary tariff every three months, keeping the 5-cent fare in effect. Due to the fact that it did not receive sufficient revenue last year with which to pay expenses and taxes, and anticipating increased expenditures in the way of higher wages this year, the company filed with the department of public works, to take effect April 1, an experimental tariff to run for three months eliminating transfer privileges except from the Lowell-Smelter line to the bayside cars.

The company, in turn, was informed by the department of public works that it would allow this to go into effect unless a protest was filed by the citizens of the community, in which case it would not allow it to go into effect, but would give the company and all concerned a hearing. There matters stand.

The company concedes the right of the people, who pay the fare and support the road, to have some voice in how these fares should be paid. All the company asks is that the fares shall be sufficient to allow it to pay the employees a living wage and to give the company something near a reasonable return.

Forty-two Buses for Akron

Northern Ohio Company Has Bought $300,000 of Vehicles for City and Interurban Service

The Northern Ohio Traction & Light Company, Akron, has purchased forty-two new buses, of which twenty-eight will be used in Akron city and the remaining fourteen will be used in the Akron-Cleveland interurban service. The buses represent an investment in excess of $300,000.

The interurban buses will be of the de luxe chair car type. They are White chassis with Bender bodies. Each seats 20 passengers. It is planned to maintain a fifteen-minute service between the two cities. During the last thirty days a 75-cent rate to Cleveland on Mondays, Wednesdays and Fridays has so increased travel that the regular thirty-minute service has proved inadequate.

For the city service ten Whites seating twenty-five each, six Macks seating twenty-five each, six Reos seating twenty each and six Masons seating twenty each have been purchased. Some of the bodies are being built by The G. C. Kuhlman Car Company. All bodies are steel and of the same type as the twenty-four buses now used by the company in its Akron city service.

The new routes to be served include extending the Akron crosstown line east to the Martha Avenue loop; Maple Street line west to Hawkins Avenue; new line from car line terminal on Wooster to West South Street; South Main from Steiner Avenue to Firestone Boulevard.

The buses will give service to sections of Akron which now have little or no transportation facilities.

Buses for Bridgeport in Coordination with Railway

The Connecticut Company believes it has made initial overtures to the community at Bridgeport in the matter of bus service upon routes not served. As a result it will await expressions from the community as to the desirability and acceptability of the proposed auxiliary service.

The chief factor in the consideration is one of finance. Less important is the matter of securing the bus equipment which it is conceded can be taken care of within a reasonable time. President Storrs has pointed out that the Connecticut Company is committed to a policy of extending bus service.

The commission has now before it the proposition of passing upon the petitions of local individuals and corporations for the operation of bus lines and at the same time the proposal of the Connecticut Company to start lines. Upon the decision of the commission will depend to a great extent the time within which the bus service will be established.

Mr. Storrs outlined what the Connecticut Company recognizes as needed routes in Bridgeport, as follows:

1. Iranistan Avenue as far as the bathing beach in summer and as far as the park in other periods of the year.
2. Through Howard Avenue and Spruce Street to serve the industries located in the West End as well as the industrial workers who have their homes in this territory.
3. Out Madison Avenue over routes as now served by jitneys and further beyond the jitney route on Madison Avenue itself if occasion requires.
4. From the industrial territory on the southerly side of the New York, New Haven & Hartford Railroad tracks in East Bridgeport across the railroad tracks and through the industrial settlement on the northerly side of the tracks as far as the General Electric plant.

Mr. Storrs holds to the opinion that it is only through such co-ordinated service that the city of Bridgeport can obtain a thoroughly efficient transportation medium operated for the benefit of all of the people of the city at the lowest possible charge.

Storm in East Hampers Traffic

Simultaneously with the preparation of spring and summer schedules for electric railways came on April 1 a wind, snow, sleet, thunder and lightning storm, the only real blizzard on the Atlantic Coast during this winter. Four deaths and many injuries were reported. Heavy traffic congestion, blocks, tie-ups, isolation of towns and a cost to New York City of $250,000 were the minor results. Eight inches of snow fell in New York City. In addition to the "L" and train service being generally hampered there were traffic delays on the Long Island road, the Brooklyn-Manhattan Transit lines, the New York & Queens County Railway and the municipal cars on Staten Island. A serious accident occurred when a B.-M. T. shuttle train and an Interborough elevated train crashed in Long Island City. In this collision one person was killed and thirteen injured.

Mr. Turner Retained at Pittsburgh

The Council of Pittsburgh has confirmed the appointment by the Mayor of Daniel L. Turner, New York, to be chief engineer of the survey to be made of transit and traffic conditions in Pittsburgh. An advisory committee consisting of Ralph S. Rainsford, chief engineer of the Pittsburgh Railways; L. W. Monteverde, representing the real estate board, Henry Tranter, the Civic Club and Allied Boards of Trade; George S. Davison, the Chamber of Commerce and planning commission and W. M. Jacoby the Retail Merchants' Association, was named and confirmed at the same time.

With this organization subway and other solutions of traffic problems is left for consummation of a plan. Funds amounting to $60,000 taken from the $6,000,000 authorization for the downtown subway will be made available for the study or survey.

Bus Operation in Prospect in Albany District

The United Traction Company, serving the cities of Albany, Rensselaer, Watervliet, Troy and Cohoes, N. Y., is planning to put trackless trolleys into operation in Cohoes and the city of Rensselaer on certain lines which act as feeders to the main arteries of travel.

In the city of Rensselaer, situated immediately opposite Albany on the east side of the Hudson River, application was made to the Common Council on April 1 for permission to substitute buses on one of its city lines. A public hearing is to be had on the application on April 15.

Plans to tear up the Cohoes belt line tracks and supplant the street cars with trackless trolleys, the work probably to be completed before summer is over, were disclosed last week by officials of the United Traction Company. It is expected, if the Cohoes plan proves a success, that other "feeder" lines in the Capitol district may be replaced by "pneumatic-tired trolleys."

The company must first obtain permission from the Public Service Commission to install the new cars and then must convince the Cohoes Common Council that the move will be a wise one. After arrangements with the city have been completed about three months will be necessary to make the change.

Trackage to be abandoned is about 2.3 miles long. It will cost the company about $74,000 to remove the tracks and repave the street, Ernest Murphy, general manager of the United Traction Company, told Mayor Cosgro of Cohoes.

Northern Ohio Is Rehabilitating Mahoning Valley Line

Through passenger service between Akron and Warren and Akron and Alliance every two hours was established by the Northern Ohio Traction & Light Company on April 1. Light-weight Peter Witt cars are being used. The old cars are to be rebuilt into freight cars and trailers.

At the same time the company began the work of completely rehabilitating the Cleveland, Alliance & Mahoning Valley Railroad from Ravenna to Warren and Ravenna to Alliance. This road the company recently took over under a purchase agreement with the bondholders. All curves are to be renewed at once and 45,000 new ties placed in the roadbed. New rail will be laid in many places where the old rail was badly worn.

Connection is made at Silver Lake Junction from Alliance, Newton Falls and Warren with limited trains to Cleveland, while freight trains operate direct from these cities to Cleveland, Detroit and other cities. Freight terminals are to be increased at all points in the immediate future. The C., A. & M. V. line offers excellent freight opportunities and these are to be embraced by the Northern Ohio Traction & Light Company.

Arrangements are being made to start a thirty-minute service between Newton Falls and Warren. Weekly passes will probably be sold for use on this line.

A. C. Blinn, vice-president and general manager of the Northern Ohio Traction & Light Company, is conducting a speaking tour through the towns and cities reached by the old C., A. & M. V. lines. He is asking the co-operation of the people in bringing the road out of the chaotic condition in which it has been for several years. His appeals are meeting with splendid response.

Ordinance Passed in Cleveland to Inquire Into City Purchase

The Council of Cleveland, Ohio, has passed an ordinance which calls for a committee of five, to work in conjunction with the street railway committee, to survey the feasibility of taking over the entire property of the Cleveland Railway, now operated under a service-at-cost arrangement. The survey is to include a report on the value of the property and recommend a means of financing the purchase.

$4,000,000 Long Island Electrification Authorized

The Long Island Railroad announced on April 3 that the largest improvement budget in its history had been authorized by its board of directors, and that instructions had been issued to carry out the work with the least possible delay.

The budget provides among other things for the electrification of the Montauk division from Jamaica to Babylon at a cost of $4,000,000.

The date set for completion of the electrification work is May, 1925, in time for the summer schedule. The completion of this work will improve the whole operation of the railroad system, greatly reduce the transfer of passengers at Jamaica, enable the railroad to operate more trains in the congested section between Amityville and Jamaica, lessen the running time of local trains and give service similar to other electrified branches of the system.

G. R. Van Namee Named for New York Commission

Governor Smith on March 31 transmitted to the New York State Senate the nomination of George Rivet Van Namee, Watertown, N. Y., as a member of the Public Service Commission to fill a vacancy caused by the resignation of James A. Parsons for the unexpired term of nine years.

Mr. Van Namee became a member of the Public Service Commission, Second District, upon which he served until the consolidation of the commissions under the Miller administration of 1921. He then returned to Albany as secretary to Governor Smith.

Higher Fare Sought.—The Indianapolis Street Railway, Indianapolis, Ind., has applied to the Public Service Commission for a 7-cent cash fare with a 6¼-cent ticket rate. A 1-cent transfer charge is also sought. The present fare is 5 cents cash and 2 cents for a transfer. Corporation Counsel Groninger recently stated that the city would insist on seventeen tickets for $1.

Pittsburgh Men Ask Wage Conference

Business Agent John L. Nelson of Division No. 85, Amalgamated Association, representing the 3,000 motormen and conductors of the Pittsburgh Railways, has served notice that changes will be asked in the existing agreement between the company and the union. The notice is in accordance with the existing agreement, which expires at nidnight, April 30.

A note simply announcing that changes will be asked, and not going into any details on the nature of the changes—which, however, are understood to include a request for a wage increase—was handed to General Manager Fitzgerald of the railway along with a request that the changes be taken up in conference at an early date convenient to the company. This date will be fixed later.

New York State Men Present Wage Request

The Rochester, Syracuse and Utica divisions of the Amalgamated Association, in a proposal for a new contract effective May 1, submitted to James F. Hamilton, president of the New York State Railways, seek a 70-cent hourly wage and a six-day week. More than 3,000 workers make up the three city divisions, which are carrying on joint negotiations. Contracts, however, are made separately with the three unions.

The scale now in effect went into force last May. It provides as follows: 51 cents for the first three months, 53 cents for the next nine months and after one year 55 cents an hour. An increase of 5 cents an hour was granted last year. In the proposal just submitted, the men ask a scale of 66, 68 and 70 cents and a 10-cent increase over those amounts for operators of one-man cars.

Unusual Agreement Effected

An agreement has been made between A. K. Ellis, general manager of the Wisconsin Traction, Light, Heat & Power Company, and Olaf M. Lundquist, owner of the Inter-City Transportation Company, Inc., whereby the traction company will take over the motor bus business of this company, which has been furnishing competitive bus service parallel to the interurban line in Appleton, Menasha and Neenah. Mr. Lundquist, formerly owner of the Inter-City line, has been placed in charge of the new department due to his bus operating experience and close touch with local bus conditions.

Wages Advanced in Atlanta Three Cents an Hour

The arbitration board called to settle the wage dispute between the Georgia Railway & Power Company, Atlanta, Ga., and its railway employees has decided on an advance of 3 cents an hour. The company announced that the amount would be paid. Under the new schedule of wage rates, effective as of Jan. 1, 1924, employees paid by the week will receive a 10 per cent increase. Employees working by the hour who are not trainmen received an increase of 3 cents an hour and platform men's wages were raised 3 cents an hour for the first nine months, 8 cents an hour for the second nine months, and thereafter raised to 51 cents an hour.

The company estimates that the increase will add about $235,000 to the expenses for the year.

Wages in Memphis Will Be Arbitrated

Unable to reach an agreement on the new wage scale for the employees of the Memphis Street Railway, Memphis, Tenn., for the year beginning April 1, representatives of the company and the union have announced their decision to leave the settlement to arbitration. This is in accord with the agreement made by both sides last year. On March 1, thirty days before the year's contract expired, the union advised the company of its demand for an increase. The company responded with the demand for a 4-cent cut, which was refused by the employees. Then representatives were appointed to confer in an effort to reach an agreement. The wage scale in effect for the last year is 42 cents an hour for first year men, 47 cents for second year men and 52 cents for men in the service longer than three years.

Fare Readjustment Asked in Baltimore

The United Railways & Electric Company, Baltimore, has filed with the Maryland Public Service Commission a petition asking that rates and charges be fixed to yield the company an annual net income of $1,500,000. The request also is made that until this be done the present rates and charges be maintained. The present fare is 7 cents.

The petition is signed by C. D. Emmons, president, and William H. Maltbie and Joseph C. France, attorneys for the company. It is pointed out that $1,500,000 is the income which the commission itself had decided was reasonable, necessary and in the public interest. The minimum annual net income set by the commission was $1,000,000.

In its appeal to the commission the company says that the granting of the petition, which seeks to readjust fare zones, will reduce materially the gross income without decreasing the expense of operation. Although no request is made for a specific rate, the petition points out that the 7-cent fare is lower than that charged in many other cities.

In 1919, the petition states, the commission established rates and charges intended to yield a minimum surplus of $1,000,000 to the company and placed upon the latter the burden of increasing this amount to $1,500,000 through exercising economy and efficiency. Statements filed during the last four years show that from Jan. 1, 1920, to Dec. 31, 1923, the total net surplus is $3,454,365, or $2,545,635 less than the $6,000,000 which should have been collected at the rate of $1,500,000, the amount set forth by the commission as necessary in the interest of the public.

Rerouting Proposals in Toledo Approved

The City Council at Toledo has approved eleven of the individual proposals in the rerouting plan submitted some weeks ago by Commissioner W. E. Cann for extensions and betterments to the service supplied by the Community Traction Company. One which has been delayed is the elimination of the Indiana line. The most important item in the new legislation was the final approval of the trackless trolley crosstown line by way of the Fearing Street subway. The new route for the Long Belt line, which will be out Contan Street and Cherry to Central Avenue and providing for elimination of tracks on Collingwood Avenue between Delaware and Central, is another important move. The north arm of the Short Belt will be connected up with the southern arm of the Bancroft Belt. The new extension of Summit Street will be double-tracked. Track will be laid in Jackson Street for a new short interurban loop downtown. Extensions will be made on the East Broadway line and the Erie Street bus feeder will be eliminated. The Collingwood bus line, Ottawa Park line, elimination of the Michigan line and change in route for the Erie Street line will come up later for action by Council. In voting upon the separate issues the Council also approved a general rerouting of the cars in the business section.

Commissioner Cann told the members of Council that he had figured the deficit down to $48,000 a year under the new system and believed that additional business would make that up and add to the stabilizing fund.

He said in a letter to Councilman Dowd that the adoption of the plan would not result in increased fares, but would produce material increases in the balance of the stabilizing fund. His original estimated deficit was $102,857. He believed the new power rate offered by the Toledo Edison Company would mean a saving of $100,000 a year.

The officers of the Community Traction Company will have to go over the projects and give their views on probable costs and revenues before the improvements can be made. Then there will come the necessity for financing.

Bus Drivers Strike in Newburgh

Bus drivers employed by the Public Service Corporation of Newburgh, N. Y., went on strike March 18 and the city was without bus service until March 21. The strike was called in protest against the discharge of sixteen members of the bus drivers' union and the arrest of three others on complaint of the corporation on charges of larceny and alleged improper handling of collections.

When the members of the drivers' union became convinced that the company's action in discharging the sixteen employees was not an attack upon the union itself, the men returned to work. The sixteen discharged drivers were not reemployed, although charges against them are understood to have been dropped. Buses were installed to replace the local railway some time ago.

Strike in Scranton

Inability to Agree on Questions of Wages and Rush-Hour Tripper Service Results in Walk-Out

Railway service was abandoned in Scranton, Pa., on April 1, when 600 employees of the Scranton Railway walked out following the inability of the company and the men to come to an agreement on wages and rush-hour tripper service. The trainmen are demanding an increase of 17 cents an hour. The company is willing to submit both the wage question and the rush-hour tripper service to arbitration, but the men are demanding that only the wage be arbitrated and that the question of tripper service be dropped.

A conference between representatives of the company and the striking employees was held on April 3, the participators being Mayor John Durkan, Bishop J. J. Hoban, the publishers of both daily newspapers and representatives of the United States Department of Labor. Neither side would recede from the position taken and the conference adjourned without any progress having been made. In order to meet the emergency caused by the strike the Public Service Commission has granted authority to the city of Scranton to issue ten-day permits to jitney operators provided satisfactory guarantee as to personal and property liability is given.

The wage contract expired on April 1. Prior to that date Division 168 of the Amalgamated presented a contract asking for an increase for all employees, amounting to 17 cents an hour. Along with this demand double time was sought for Sundays for trackmen, carhouse men and shopmen. A meeting was held on March 25, at which the men presented their demand for increased wages. When the increase was refused the men inquired what counter proposition the company had to offer. The company then submitted the contract the men are now working under, with a proviso for "spread runs," i.e., runs twenty or less to take care of morning and afternoon rush. Under them the men would work approximately eight hours in a spread of thirteen, similar to men in other cities. Following that meeting the employees' committee called a midnight meeting, took a strike vote and notified the management that the men would not arbitrate the questions involved.

The wages paid to the Scranton Railway employees have been advanced 26 per cent since January, 1920. At that time the wage was 50 cents an hour. The present scale is 63 cents an hour. With the demand of the men satisfied the scale would amount to 80 cents an hour, totaling an increase to the company of $300,000 a year.

In a statement to the public J. J. Coleman, general manager, said the net profit last year, after deducting operating expenses, taxes, bond interest and other fixed charges, was only $94,000. The company's earnings for the year were $85,000 short of what the State Public Service Commission fixed as the amount the company was entitled to earn. Of last year's net profit of $94,000, $80,000 was earned during the first three months. Wages were raised to their present level on April 1, and from that date to the close of the year, a period of nine months, only $14,000 was earned.

Weekly Pass in Victoria—Free Movie Admittance

Weekly passes were put in effect on the Saanich line of the British Columbia Electric Railway, Victoria, B. C., on March 29. This is an interurban line, 24 miles in length, traversing a rural district adjacent to Victoria. The basis will be less than the price of six round-trip tickets between two points. The purpose is to improve traffic, which has been cut down by motor and bus competition. The Saanich line has been operated with one-man cars for more than a year. Under the pass system, a passenger when boarding a car will show his pass and receive a "hat check," which he will deposit with the operator on leaving the car. In order to popularize the new passes the company has arranged to have passholders admitted to one of the moving picture theaters free on every Thursday in April. A supply of passes for four weeks may be bought at once.

Foreign News

Tramway and Bus Strike in London

A great strike of tramway and bus employees in London began on March 22, causing enormous inconvenience and loss of time to the public. All the tramway undertakings of the metropolis and the London General Omnibus Company were involved, but a comparatively small number of buses belonging to minor companies continued to run. These, however, were but a drop in the bucket. People had to use the steam and electric main lines, where these were available, or to walk, except in the case of those wealthy enough and fortunate enough to be able to use cabs. Both tramway men and busmen are now combined in one trade union called the Transport and General Workers Union. It was primarily a tramway men's strike, their demand being for an increase of wages of 8s. per week. The bus men had no particular grievance, but they came out "in sympathy" with the tramway men.

The wages ruling in the London district for tramway drivers and conductors at the time of the strike were 58s. per week, rising to 67s. after two years' service. The bus drivers began at 80s. 6d., rising to 86s. 6d., while the conductors got 73s. 6d., rising to 79s. 6d. It had always been contended that bus drivers' work requires more skill than tramcar drivers' work, and that this is the reason for the difference of pay.

It was computed that about 25,000 bus employees and 17,000 tramway employees were affected by the strike. The tramway undertakings involved were those of the London County Council and a number of smaller ones, some belonging to local authorities and some to companies in the outskirts of London.

The strike was preceded by negotiations between representatives of the parties, but these proved futile, and the government thereafter set up a court of inquiry to ascertain the facts.

For the last few years tramway men's wages in England generally have been regulated by a national agreement under which wages rise or fall 1s. per week for every five points rise or fall in the official index figure of the cost of living. By their demand and by their strike action the London men broke away from the agreement, and did so without giving the stipulated three months' notice. They averred that their wages were 5s. a week lower than in September, 1922, when the cost of living figure was the same as now. That did not appear to accord with the sliding scale agreement.

Before the negotiations collapsed, the tramway authorities, while declaring that the financial condition of their undertakings was such that they were unable to pay any higher wages, in some cases made compromise offers. The London County Council, West Ham, and Walthamston offered an increase of 5s. per week, while others offered 2s. and some offered nothing. An alternative proposal by the employers was that the whole dispute should be submitted to arbitration.

The main reason given by the employers for the bad financial position of the tramways was unrestricted bus competition. The trade union representatives rejected all the offers made by the employers.

It was when the National Council for the tramway industry found that it could not solve the difficulty that the individual offers were made by the employers. The London County Council issued a statement to the effect that its offer of 5s. a week would mean an increased expenditure of at least £100,000 a year, while the receipts for the present financial year now closing showed a decline of nearly £400,000 compared with the previous year.

The position of the tramway companies affected which are included in the underground railways "combine" was set out in a statement signed by Lord Ashfield, chairman of the group. In this it was stated that for the year 1923 the return on capital of the Metropolitan Electric Tramways, the London United Tramways Company and the South Metropolitan Electric Tramways, after providing a totally insufficient sum for renewals, was less than two-thirds of 1 per cent. In the first two months of this year the three companies were in a worse position and actually failed to meet their fixed charges by £6,393, and had no funds for renewals. The earnings lost to the tramways were not gained by the underground railways or the buses.

Financial and Corporate

Birmingham Properties Sold

Local Railway and Light Units Pass at Foreclosure to National Power & Light Company

The properties of the Birmingham Railway, Light & Power Company were sold for $18,500,000 to the National Power & Light Company, New York, at noon March 31 in front of the courthouse door by J. S. Pevear, special master. The properties were bought in the name of the Birmingham Electric Company, organized a few days ago to purchase and operate the properties. Bidding was spirited. Starting at $13,000,000, the price gradually rose to $18,500,000.

Other companies which bid for the properties were the United Gas & Electric Engineering Company, New York, and the L. H. McHenry Company, Louisville, Ky. L. B. Hatch represented the purchasing company at the sale.

Sale of the property was made subject to outstanding debts and it is understood that the bid accepted will make the price of the properties approximately $30,000,000. There are outstanding about $9,500,000 of bonds, which it is stated are to be assumed, and about $2,000,000 receiver's obligations, which must be met.

TIDEWATER SALE POSTPONED

Sale of the so-called Tidewater line was called for 12:30 o'clock, but no bidders appeared. Mr. Pevear announced that the sale would be postponed until April 14, at noon, when this line will again be offered for sale. Should there be no bidders at that time, Mr. Pevear announced that the line will continue to operate in the hands of the receivers and efforts will be made to give as good service as its receipts will permit.

Confirmation of the sale of the Birmingham Railway, Light & Power Company property is expected following the return of Judge William I. Grubb of the United States District Court from New Orleans. Pending the confirmation of the sale and the formal transfer of the properties to the Birmingham Electric Company, the operation will continue under the direction of Lee C. Bradley and J. S. Pevear, co-receivers.

H. C. Abell, president of the National Power & Light Company, stated following the sale that his company, some two or more years ago, acquired the capital stock and some of the debt of Birmingham Railway, Light & Power Company, formerly owned by American Cities Company. He said that more than $10,000,000 of debts of the old company will be paid off in full, thus laying the basis for a sound program for future financing. Among the debts so to be paid will be the $781,000 of first mortgage 5 per cent bonds of Birmingham Railway & Electric Company which fall due on July 1, of this year. It is expected that arrangements will be made so that the holders of these bonds can get principal and accrued interest at any time on surrender.

In line with modern practice the Birmingham Electric Company will have non-par value stock, both preferred and common. No change is contemplated in the present executive management. The temporary board of directors of Birmingham Electric Company will continue to function for the time being, but it is expected that the permanent board of directors will be composed, for the most part, of residents of Birmingham.

A new modern serial mortgage will be created and bonds will be issued to pay a part of the debts of the old company. Between $4,000,000 and $5,000,000 of the present company's so-called senior securities will be shifted into common stock as a result of the reorganization.

Conference on St. Louis Reorganization Held in New York

F. O. Watts, president of the First National Bank, St. Louis, and one of the financial group most active in the reorganization plans for the United Railways, St. Louis, acted as chairman of the conference held in New York on April 2 to consider the affairs of the company. He is expected to be in St. Louis on April 7 and at that time will issue a statement. The meetings in New York have been under the auspices of the St. Louis Transit Company 5 per cent bondholders combined committee. Edwin M. Bulkely of Spencer, Trask & Company is chairman of this committee and William P. Gest of the Fidelity Trust Company, Philadelphia, vice-chairman. It is believed that this committee, working with the executive committee, will formulate the policies which will lift the receivership. Newman, Saunders & Company, New York, are mentioned as bankers for the reorganization committee.

New York State Railways Buys Bus Company

The New York State Railways has purchased a majority interest in the East Avenue Bus Company, Inc., operators of a 10-mile route from the heart of Rochester to Pittsford, according to J. J. Basrow, president of the bus company. Plans are under way for an extension and improvement of service. The East Avenue line will retain its separate identity. The bus line operates over East Avenue, Rochester's finest shopping and residential street, connecting the business and exclusive suburban districts. The railway operates trolley service between Rochester and Pittsford over a different route. No immediate change in either route is anticipated.

Investment Opportunities in Tractions Overlooked

There are neglected opportunities in the public utility field similar to those investment bargains which prevailed in railroad securities four years ago. This is the conclusion of H. M. Jacoby of the banking firm of H. M. Jacoby & Company, New York. He says that investors four years ago needed courage to buy railroad issues; to-day they need courage for investment in many utilities, notably tractions. Mr. Jacoby says the time of acquisition should be at the turning point and not after everything becomes bright and rosy again.

Remarking that his firm was not obligated to hold any briefs for electric railways, Mr. Jacoby pointed out that there were many bonds of such companies selling to yield 8 to 10 per cent, a condition due to the fact that the average investor had not noticed the changing position of the traction business. In a statement made to the ELECTRIC RAILWAY JOURNAL he continued:

> It so happens that in the nature of the case there will always be certain groups of securities which are at times unpopular with investors. This has, for instance, been the case with traction securities. This lack of popularity was certainly well deserved, considering that during the period of ultra-inflated operating costs—1919—receiverships of electric railways amounted to $634,174,000 par value of securities.
>
> However, is it not interesting to note that this figure of over half a billion was reduced to only $23,039,000 in 1923 and that this figure is the lowest and most favorable one in fifteen years?
>
> We have heard a good deal about bus and automobile competition. Yet car rides per capita have increased from 100 in 1912 to 109 in 1917 and to 117 in 1922. In other words, the growth of traffic has been just about as rapid during the past five years as it has been during the five preceding years. The truth of the matter is that notably in the larger cities the automobile reaches the saturation point at a given angle while bus competition can only be of a supplemental character.
>
> To cite two recent cases: When the street car franchise in Akron expired, on Feb. 1 of this year, the trolleys were ruled off the streets and a bus service was started. Only a few weeks later, a petition signed by 33,000 citizens forced the Mayor to reinstate the trolleys on an equitable fare basis, while the jitney competition was eliminated. In New Jersey, where the jitney competition is probably more keen than in any other part of the United States, 8,000,000 more passengers were riding on the lines of the Public Service Railway in December, 1923, than in December, 1922. Here are facts with no opinion involved.

Mr. Jacoby also referred to the recent decrease in cost of certain basic commodities used by the electric railways as factors making for lowered operating costs.

$1,027,238 Deficit in Buffalo

There was a deficit last year of $1,027,238 in the operation of the International Railway, Buffalo, N. Y. The passenger revenue during 1923 was $9,468,124 and revenue from other sources $327,061. The report states that the operating revenue was $926,093 less in 1923 than in 1921, the year before the last strike. The difference in the revenue is explained by the operation of jitneys and the practice of motor car owners in giving a lift to persons who would otherwise use the street cars.

President Tulley told the stockholders that the Bailey Avenue bus line is being operated at a loss of $2,000 a month.

The International now awaits only the determination of its property value and the sanction of a higher fare, says the report, to complete the following program:

> To render adequate service to the public; to promote among the employees efficiency and co-operation and a betterment of their conditions; to protect the owners' investment in the property and to assure the earning and payment of a reasonable return.

Mr. Tulley states that 99 per cent of the eligible employees of the I.R.C. are stockholders of the company. The wages of I.R.C. employees were raised 2½ cents an hour for 1924. They signed over the money, amounting to about $200,000, to the trustees of their association, who bought for them $1,000,000 par value I.R.C. stock for $100,000 and $200,000 par value I.R.C. bonds at 50 cents on the dollar. This investment will pay them 5 per cent.

A separate individual savings fund has also been started for the men.

New Jersey Company Making Progress

President McCarter Looks Hopefully Toward the Future—Reviews the Past Year's Work—Riding Is on Increase and Revenues Are Better

THE Public Service Corporation of New Jersey reports for the year ended Dec. 31, 1923, a net increase in surplus before the payment of common stock dividends of $3,737,179. The Public Service Railway, operating 893 miles of track and 2,420 cars, and its affiliated companies report deficit of $1,675,534 for the year.

In reviewing the affairs of the company, President T. N. McCarter, in speaking of the railway, says that the company has made considerable progress in perfecting its plan for co-ordinating street car and bus service and has been able to put into effect some important economies in operation, which permit the hope that, with public co-operation in the carrying out of the company's co-ordination scheme, the railway will, within a reasonable time, be operating on a satisfactory and stable basis. Mr. McCarter says that the new rates have not so far produced adequate revenue for the operation of the system, but that they have quite largely increased riding and that revenue is much more satisfactory than at first.

Operation of the railway for the first six months of 1923 showed a margin of some $202,000 after payment of operating expenses and fixed charges, but this amount and more was needed to meet the deficit accumulated since 1917. Trouble for the company was precipitated with the expiration on Aug. 1 of the wage agreement with the railway employees and their demand for an increase in pay amounting to 30 per cent.

The financial condition of the company was such that it was impossible to grant the men's demand. Every endeavor was made by the company to secure a renewal of the agreement with the men at the old pay and as a compromise the company offered to apply to wage increases the estimated suplus for the year, but without success. On Aug. 1 the trainmen quit work and for a period of fifty-one days no cars were operated. The decision of the company not to attempt operation with new employees was based on the impossibility of securing a sufficient number of competent men and upon its belief that any attempt to run cars would lead to disorder and the destruction of property.

After careful consideration, there was presented to the state and municipal authorities and to the public generally a "plan of settlement," providing for the co-ordination of both trolley and bus operation under the company's management. It was stipulated that the company would purchase competing buses, give employment to competent bus operators, grant a 20 per cent increase in wages to employees and put into effect a universal fare of 7 cents with transfers between trolleys and buses. The municipal and state authorities were asked to co-operate.

This plan indorsed by commercial organizations all over the state, was accepted by a number of municipalities and petitions favoring its acceptance were signed by nearly 400,000 citizens. Owing to the mixed jurisdiction of the state and the municipalities, however, the plan was not accepted. The stoppage of street car service and the inability of the buses adequately to supply the demand for transportation was in the meantime causing such loss and inconvenience to the public, and especially to business men, their employees and patrons, that the Governor of the state, acting through the Attorney-General, and on the plea that public interest required the immediate resumption of street car service, brought an action in equity before the Chancellor for an injunction to compel the company to resume service.

In granting the injunction, the Chancellor pointed out that the way was open for a just settlement of the transportation difficulty, saying as to the effect of the court's action: "I think . . . that the effect will be to stimulate negotiations to settle the many difficulties with which the company is confronted."

The injunction was accepted without appeal by the company, which granted a 20 per cent increase in wages and resumed operation on Sept. 21.

Mr. McCarter explains that shortly afterward the company adopted, at the suggestion of the Board of Public Utility Commissioners, for a trial period of four months beginning Oct. 1, a rate schedule which provided within the limits of the larger cities served a 5-cent fare with an additional 5-cent charge in the suburbs, no transfers. The rate of 8 cents, four tokens for 30 cents, 1 cent transfer, in effect before the strike, was continued in all other parts of the territory. This schedule as applied to the traffic of the railway is substantially equivalent to the fare in effect before the cessation of service.

With respect to the railway's rate case Mr. McCarter says that on June 9, 1923, former Judge Thomas G. Haight, the special master appointed by the United States District Court to take evidence in the proceedings instituted by the Public Service Railway in 1921, handed down a report fixing the value of the company's property used and useful in the operation of the company at $110,000,000 and continuing the rate of 8 cents, four tokens for 30 cents, 1 cent transfer.

To this report the company filed exceptions on the ground that several items had been improperly omitted which if included would have given the property an increased value, while the defendants excepted on the grounds that the value was too high. The exceptions have been argued before the District Court, which reserved decision. On Oct. 1 the fare schedule now in effect was applied for at the suggestion of the Board of Public Utilities Commissioners and was accepted by the United States District Court, without prejudice to the proceedings before that court.

During the year the railway charged to fixed capital installed during the year $2,651,089, less $603,359 of property written off, leaving the net in-

INCOME ACCOUNT OF PUBLIC SERVICE RAILWAY AND AFFILIATED COMPANIES FOR THE TWELVE MONTHS ENDED DEC. 31, 1923

	Public Service Railway	Public Service Railroad	Affiliated Companies	Total
Operating revenues	$21,524,601	$265,533	$1,314,868	$23,105,003
Operating expenses and taxes	17,407,259	212,534	977,829	18,597,623
Amortization charges	945,553	....	137,200	1,082,753
Operating revenue deductions	18,352,812	212,534	1,115,029	19,680,376
Operating income	3,171,788	52,999	199,839	3,424,627
Non-operating income (exclusive of dividends of affiliated companies)	93,375	808	26,126	120,308
Gross income	3,265,163	53,807	225,965	3,544,936
Income deductions (bond interest, rentals and miscellaneous interest charges)	5,244,217	114,576	52,715	5,411,510
Net income or loss	*1,979,054	*60,769	173,249	*1,866,574
Profit and loss accounts (excluding dividends)	†176,697	†3,688	†10,829	†191,215
Surplus—(before dividends)	*1,802,357	*57,080	184,079	*1,675,358
Intercompany dividends	†284,624	....	284,624	....
	*1,517,733	*57,080	*100,544	*1,675,358
Dividends paid unaffiliated interests (directors)	....	....	176	176
Net increase or decrease in surplus	*$1,517,733	*$57,080	*$100,720	*$1,675,534

* Deficit. † Credit.

TRAFFIC STATISTICS OF THE PUBLIC SERVICE RAILWAY FOR LAST TEN YEARS

Year	Revenue Passengers	Transfers and Passes	Total Passengers	Percentage of Passengers Using Transfers	Average Fare per Passenger, Cents	Car-Mileage	Car-Hours	Passengers per Day	Passenger Receipts per Car-Mile, Cents	Passenger Receipts per Car-Hour
1914	310,308,660	96,969,254	407,277,914	21.2	3.83	50,792,889	5,665,119	1,115,830	30.72	2.75
1915	313,923,363	100,498,677	414,422,040	21.5	3.82	51,873,660	5,573,670	1,135,403	30.49	2.84
1916	342,205,993	109,492,019	451,698,012	21.8	3.82	54,964,708	5,911,131	1,234,147	31.37	2.92
1917	361,187,782	115,787,201	476,974,983	21.9	3.82	56,087,403	6,021,225	1,306,781	32.44	3.02
1918	352,190,897*	98,029,909	451,220,806	20.0	4.31	54,039,150	5,698,089	1,236,221	36.00	3.41
1919†	327,619,606*	69,069,628	396,689,234	15.4	5.71	57,644,927	6,039,453	1,086,820	39.29	3.75
1920	363,757,587*	89,777,107	453,534,694	17.7	5.79	60,798,743	6,539,207	1,239,166	43.21	4.02
1921	348,284,212*	87,395,589	435,679,801	17.3	5.90	58,309,883	6,212,276	1,193,643	44.11	4.14
1922	325,265,180*	84,947,634	410,212,814	17.6	6.27	56,419,982	5,983,122	1,123,871	45.59	4.30
1923	300,319,928*	53,875,005	354,194,933	12.4	5.95	49,272,078	5,206,092	970,397	42.75	4.05

* Excluding revenue transfer passengers. † Mile zone system in effect from Sept. 14 to Dec. 7.

crease in the fixed capital $2,047,729. The railway also retired $388,000 of equipment trust certificate of series "D," "E" and "F" in accordance with the equipment trust agreements.

The report contains as a frontispiece a reproduction of a half-tone showing types of cars, buses and operators for use in co-ordinated service.

Issue of Stock for Acquisition Purposes Completed

The Charleston Interurban Railroad, Charleston, W. Va., has completed plans to issue $500,000 of cumulative participating preferred stock of the par value of $100. The company proposes to use the proceeds from the sale of 4,250 shares of the preferred stock to acquire all the capital stock of the Kanawha Valley Traction Company and the Charleston-Dunbar Traction Company and to use the proceeds from the sale of 750 shares of the preferred stock to defray the cost of certain improvements. The rest of the money from the sale of stock is to be used for other corporate purposes.

Fare Advance in Cincinnati Explained

Exact figures on the operation of the Cincinnati Traction Company, Cincinnati, Ohio, for February and on which the fare advanced on April 1 from 8½ to 9 cents have been announced by W. J. Kuertz, Director of Street Railroads. The deficiency for February was $24,826, and the total loss for two years—1922 and 1923—is $574,786. This includes deficiency for city tax since Oct. 1, 1923. For three months in 1923, October, November and December, the city tax amounted to $89,000. For the two months in 1924, January and February, it amounted to $57,677. The deficiency for return on capital in 1922 amounted to $163,278 and in 1923 to $264,830.

There was a daily decline in the number of revenue passengers for February, 1924, as compared with 1923, although the aggregate for February this year is greater, due to having twenty-nine days. The revenue passengers in February, 1924, brought $8,549,249 and in February, 1923, the revenue was $8,343,104.

Although detailed figures are unavailable the number of daily passengers during March is 10,000 below that of March a year ago. Unemployment, the use of the radio in the homes and bad weather are some of the explanations offered, as well as the increase in fare, it being 1 cent more this year.

Purchase of Boston "L" by State Urged

An order has been filed in the Massachusetts Legislature calling for the appointment of a special commission to consider the advisability of the state acquiring the property of the Boston Elevated Railway. Representative Coyne contends that under the present law the State has the right to purchase the properties by paying the amount of the outstanding stock, approximately $52,000,000. He said purchase by the state would save $4,000,000 in dividends annually and that it would eventually result in a reduction of fare.

Indiana Road Purchased from Bondholders

Purchase of practically all bonds of the Goshen and Peru divisions of the Winona Interurban Railway, Warsaw, Ind., by Harry Reid and James P. Goodrich, Indianapolis, and Theodore Frazer, Warsaw, has been announced.

The plan of the new holders of the bonds, according to Pierre Goodrich of Mote & Goodrich, is to foreclose the mortgages on the property, sell the railway and terminate the receivership.

More than $2,000,000 in bonds are outstanding, $1,593,700 on the Peru division and $750,000 on the Goshen division.

Plans of the new owners include through traction service from Indianapolis to South Bend, both for passenger and freight service.

Mr. Reid, one of the purchasers, is president of the Interstate Public Service Company, but it is said that that company is not interested in the purchase as a company although the lines bought will be tied in with those of that property for through operating purposes. In fact, the Winona property, extending from Peru to Goshen through Warsaw and Winona Lake, is the connecting link in a through interurban route from Louisville through Indianapolis to South Bend and Chicago.

The likelihood of this purchase being made was referred to in the ELECTRIC RAILWAY JOURNAL for Feb. 2, page 195.

Arrears in Dividends Being Paid in Worcester

The directors of the Worcester Consolidated Street Railway, Worcester, Mass., have declared an extra dividend of $2.50 a share to apply on dividends in arrears on the 5 per cent cumulative preferred stock. The dividend was paid by the company on April 1 to stock of record March 20.

On April 1, 1922, the accumulated and unpaid dividends amounted to $20. At that time a $2.50 extra was paid and this has continued semi-annually. The dividend paid on April 1 this year makes the fifth extra and cuts the amount in arrears from $20 to $7.50.

Operation Abandoned Between Greenfield and Northampton

The towns on the 20-mile stretch between Greenfield and Northampton, Mass., which for twenty years have been served by the Connecticut Valley Street Railway, are without service. The operation of the line ceased March 31 at midnight. The receiver will delay application to the courts to dismantle the road pending possible purchase of it by the towns themselves for municipal operation. Nine miles of the Greenfield to Northampton division have already been thus purchased with the intention of reopening the road. The portion sold runs from Greenfield through Deerfield and South Deerfield. Traffic between Greenfield and South Deerfield is now being handled by a bus service.

Rochester Valuation May Be Reduced

Unofficial reports say that a settlement of the litigation instituted by the city of Rochester to reappraise the Rochester lines of the New York State Railways under the service-at-cost contract is in prospect. Conferences looking toward a settlement have been held and it is said to be not unlikely that an amicable adjustment of the entire matter will be had to the best interests of the company and also to the public.

The plan for settlement is said to comprehend a reduction in the valuation, principally by the elimination of certain items in the appraisal, which the company will consent to as a matter of compromise. Such a readjustment, possibly by the elimination of certain real estate, will bring a reduction in the valuation and with it will go the possibility of the public of the city of Rochester obtaining a lower fare.

James F. Hamilton, president of the New York State Railways, is confident that the present appraisal is justified by any method of appraising that may be used, and maintains the actual book value of the property used and useful, under methods of appraisal approved by the United States Supreme Court, can result only in a higher valuation than that now existing.

In commenting on the matter one of the Rochester papers says:

> The attitude of the company has been to welcome the trial of the litigation so as to settle once and for all the valuation matter, but Mr. Hamilton has expressed a willingness to compromise the proposition by eliminating certain factors, so that the earnings of the company, under the contract, will be based largely on the property actually in use in the conveyance of passengers. This is looked upon by the city officials as a broad concession and one that will reflect to the benefit of the public.

Capital Structure to Be Rearranged at Portland

Stockholders of the Portland Railway, Light & Power Company, Portland, Ore., have been requested to meet and approve plans for the issue of $7,500,000 of 6 per cent first preferred stock. The company plans to rearrange its capital structure and to change the name to Portland Electric Power Company.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

Seeks to Abandon Service. — The Pacific Electric Railway, Los Angeles, Cal., has applied to the Railroad Commission for permission to abandon passenger service on the Santa Monica air line from Colorado Street, Santa Monica, to the end of the line.

Discontinuance of New Jersey Line Approved.—The Board of Public Utility Commissioners of New Jersey on April 1 approved the application of the Public Service Railway to abandon service on the Fairview extension located between Broadway and Warren Streets, Gloucester, and Collings and Mount Ephriam Avenue, Camden. No opposition was offered by local authorities. The company is required to remove appurtenances. The road yielded $4,000 a year and operation costs totaled $20,950. It is said that the company is prepared to increase the present bus service over the route.

Thrift Being Encouraged at Buffalo.—In co-operation with the Bank of Buffalo branch of the Marine Trust Company, Buffalo, the International Railway Co-operative Association has started a savings plan in addition to the co-operative wage fund for the benefit of employees of the company. The co-operative wage fund provides for impounding the wage increase granted on Jan. 1, and diverting the fund thus accumulated to purchase bonds and stock of the railway. The thrift and savings plan is a separate and distinct movement fostered to encourage regular weekly savings by employees.

Mortgage Gold Bonds Offered. — A syndicate including E. H. Rollins & Sons, New York, is offering at 98½ and accrued interest to yield about 6.10 per cent $5,000,000 of the Illinois Power & Light Corporation first and refunding mortgage gold bonds known as Series "A," 6 per cent, thirty years. The bonds are dated April 2, 1923, and are due April 1, 1953. They are secured by direct mortgage or collateral lien on properties appraised at a value very substantially in excess of the total debt and are a direct first mortgage on some of the most important power and light properties of the system.

Want to Abandon Passenger Service.—The Pacific Electric Railway, Los Angeles, Cal., has applied to the commission for authority to abandon passenger service on its line between Fifth Street (San Pedro district) and the Outer Harbor.

Revaluation of Kansas City Properties Asked.—The reorganization committee of the Kansas City Railways on March 31 at Jefferson City, Mo., filed with the Missouri Public Service Commission an application for a revaluation of the railway. The application was made with the consent and approval of Judge Kimbrough Stone, and of the receivers for the company.

Net Income Shows Increase.—The Department of Street Railways, City of Detroit, Mich., reported a revenue from transportation of $1,906,121 during February, 1924. In February, 1923, this item was $1,528,539. The total operating revenue for February, 1924, was $1,946,727, against $1,619,266 for February a year ago. Total operating expenses increased from $1,185,779 in February, 1923, to $1,418,595 in February of the present year. The net income showed an increase, being $40,834 in February, 1923, and $99,258 in February of the present year. There was an increase in total passengers carried. The number in February, 1923, was 37,707,665 and in February, 1924, 40,970,792.

Private Sale of Property. — The Greenfield & Turners Falls, division of the Connecticut Valley Street Railway is to be offered at a private sale by receiver D. P. Abercrombie of Greenfield, Mass. People of Turners Falls and Greenfield are united in their desire to maintain trolley service between the two towns, and arrangements with this point in view are being made.

Bus Line to Be Sold to Pacific Electric.—The Compton Transportation Company has been authorized by the Railroad Commission to sell to the Pacific Electric Railway, Los Angeles, Cal., its auto stage rights and property for a line operated between Long Beach, Huntington Park and intermediate points.

Accumulated Surplus $1,000,000.—The Los Angeles Railway Corporation, Los Angeles, Cal., reports to the Railroad Commission for the year 1923 that its operating revenue was $12,645,436 and operating expenses $8,915,490, giving a net operating revenue of $3,729,946. Miscellaneous non-operating revenue amounted to $113,820. Interest, rent, taxes and other deductions totaled $2,306,095. The net corporate income for the year was $1,537,670. The deficit at the beginning of the year amounted to $13,017. Miscellaneous additions to surplus for 1923 amounted to $7,497 and miscellaneous deductions were $251,874, leaving an accumulated surplus at the end of the year of $1,280,276.

Another Preferred Dividend at Louisville.—There is a strong probability that the back dividends of the Louisville Railway on its preferred stock will be cleaned up by Jan. 1, 1925, or not later than April 1, if business continues active. Directors at a meeting on March 20 declared a 2½ per cent dividend on the preferred stock, payable on April 4. This left 2½ per cent due from 1922, 5 per cent from 1923 and 1¼ per cent for the first quarter of 1924.

Market Street Ready to Redeem Bonds.—Notice has gone out to holders of the first consolidated mortgage gold bonds of the Market Street Railway, San Francisco, maturing on Sept. 1, that there has been deposited money sufficient to pay these bonds at par and accrued interest. Holders are accordingly advised to present their bonds for payment at any time prior to Sept. 1 at the office of the trustee at San Francisco or at the office of Ladenburg, Thalman & Company, New York. The bonds maturing on Sept. 1 were authorized in the amount of $17,500,000 on Sept. 1, 1894. The amount outstanding on Jan. 31, 1923, was $9,527,000.

$400,000 Issue Quickly Oversold Locally.—The Houston Electric Company has, in five and one-half selling days, just oversold an issue of $400,000 of the Galveston-Houston Electric Company 7 per cent bond-secured gold coupon notes. This money will be used to make part of the improvements to the Houston Electric Company's system under the agreement recently entered into between the company and the city provided jitneys are abolished in accordance with the ordinance voted upon Jan. 19.

$1,000,000 of Stock Offered.—Tucker, Anthony & Company, New York, head a syndicate which is offering for subscription at 93½ and accrued dividend, to yield about 7.50 per cent $1,000,000 of 7 per cent cumulative preferred stock of the Consolidated Power & Light Company. The company, directly or through subsidiaries, owns and operates the electric power and light and electric railway business in Huntington, W. Va.; Roanoke and Lynchburg, Va., and in Ironton, Ohio, Ashland and Catlettsburg, Ky., and the surrounding communities, as well as the gas business in Lynchburg. The proceeds of the issue are to be used for additions and improvements which will further expand the revenue producing facilities of the system.

Increase in Net Income.—The net income of the East Penn Electric Company and its predecessors for the year ended Dec. 31, 1923, was $603,482, against $399,991 for the same period ended Dec. 31, 1922. This fact was disclosed in the first annual report of the company, which was incorporated in July, 1922, under the laws of Pennsylvania to acquire control of the Eastern Pennsylvania Railways and to provide increased power generating facilities for the territories served by that company. During the year 1923 the consolidations were completed. The East Penn Electric Company is under the management of the J. G. White Management Corporation, New York.

Personal Items

Pittsburgh Personnel Changes

Young Men, All Especially Resourceful, Appointed to New Posts with Pittsburgh Railways

F. W. Cogswell, J. B. Donley, C. C. Gillette and J. E. Davis, all recently appointed to new offices with the Pittsburgh Railways, are especially qualified by technical training and by temperament for the positions to which they have been assigned. As noted previously in the ELECTRIC RAILWAY JOURNAL Mr. Cogswell has been made director of traffic promotion, Mr. Donley director of public relations, Mr. Gillette traffic agent and Mr. Davis special investigator.

Few men have a more detailed knowledge of the traffic habits of Greater Pittsburgh than has Mr. Cogswell. Mention any spot in the iron, steel or smoky city (it goes by all these names) and Fred Cogswell will rattle off the routes that pass by in the day and the night like the well-known hail from a machine gun. Before his appointment to the position of director of traffic promotion, Mr. Cogswell was traffic agent for the receivers of the Pittsburgh Railways, from August, 1917, to May, 1919. He served during the war as first lieutenant and later as captain and adjutant of the 53d U. S. Infantry. Before that he was assistant to the electrical engineer and traffic agent of the Pittsburgh Railways. He entered the service of the Pittsburgh Railways as load dispatcher in December, 1910. He was graduated at Carnegie Institute of Technology in electrical engineering in June, 1912. Mr. Cogswell was born in 1881.

In his new post with the company Mr. Donley looks after the newspapers, public neighborhood meetings held for the discussion of local service problems and explains matters to visiting complainants. It is no reflection on the Pittsburgh Railways to say that this is a difficult job to handle, for no matter how hard a company strives to be 100 per cent perfect different people have different ideas of perfection, so that the need exists for a peculiar combination of talent in the man assigned to handle the duties of an office of this kind. These Mr. Donley has. His resourcefulness has never failed him. He handles all the matters of a controversial nature that come before him with all the Celtic charm of a born diplomat. Mr. Donley was formerly employment agent and statistician for the mechanical department of the Pittsburgh Railways. He entered the service of the company as a shop clerk in 1902. In 1904 he was appointed chief clerk of the mechanical department, and in September, 1913, was appointed publicity agent in charge of exhibits. In June, 1915, he was appointed special investigator of the traffic department. Mr. Donley was graduated from high school and took a special course in economics at Duquesne University and a business course in the Iron City College. He was born Jan. 8, 1883.

Mr. Gillette will now apply his intimate knowledge of schedule construction to the commercial side of more miles for more revenue rather than the older purely operating viewpoint of fewer miles for less expense. Mr. Gillette was acting traffic agent of the company from May 1, 1923, to March 1, 1924. He entered the employ of the Pittsburgh Railways on Sept. 1, 1921, as a special investigator. Before that he was with the Westinghouse Electric & Mfg. Company. With that company he took the graduate students' apprentice course and special engineering course under B. G. Lamme. He also worked one year in the railway project section of the general engineering department. He entered the military service in May, 1917, and served with the Fourth Infantry, Third Division as a first lieutenant and captain from September, 1917, to December, 1919. He entered Bucknell University in 1913 and was graduated in electrical engineering in June, 1917. He was born on Sept. 1, 1895.

Mr. Davis was formerly chief clerk in the traffic department of the Pittsburgh Railways. He served in this capacity from April, 1921, to Feb. 20, 1923. He entered the service of the company in November, 1920, as a traffic observer. Before that for two years he had been timekeeper and paymaster for a mining company. He was graduated from high school in 1914 and from Geneva College in 1918, receiving the A.B. degree. In 1918 and 1919 he was principal of a high school. He was born on March 9, 1898, at Darlington, Pa.

F. W. Cogswell

J. B. Donley

C. C. Gillette

J. E. Davis

Key Route Changes Made

Announcement Affects Messrs. Drum, Harris and Allen—Mr. Harris Becomes Chief Engineer

New duties have been assumed by present officials of the Key System Transit in Oakland, Cal., and one new appointment has been made.

John S. Drum has been made chairman of the reorganized executive committee; George H. Harris, formerly assistant to Vice-President and General Manager W. R. Alberger, has been appointed chief engineer of the entire system, and Ben Allen, to whom reference has been made previously in the ELECTRIC RAILWAY JOURNAL, has been named as the head of the new public relations department.

In the promotion of Mr. Harris, Mr. Alberger, for the time being at least, is left without an assistant. Hereafter Mr. Harris will devote his entire time to engineering matters, including supervision of all the physical properties of the company. He has been in the business for thirty years. Mr. Harris has been with the Key System since 1914, being originally general superintendent. Before that he was connected with electric railways in Georgia and Alabama. Two years ago he was made assistant to the general manager of the San Francisco-Oakland Terminal Railways, a position from which he has just been promoted.

Mr. Drum was chairman of the executive committee of the former San Francisco-Oakland Terminal Railways and has been re-elected in the process of reorganization. He is well known in Pacific Coast banking circles. Mr. Drum was born in Oakland and was graduated in 1894 from Hastings Law College attached to the University of California. He practiced law until 1903 and then went into banking, becoming president of the Savings Union Bank & Trust Company in 1910. He is a director of the Pacific Gas & Electric Company, the East Bay Water Company and the Yosemite Valley Railroad.

Mr. Allen gained fame in the late war by acting as publicity director for Herbert Hoover in his food saving campaigns. He succeeds R. H. Brockhagen, press agent.

Now that a survey of Oakland's traffic needs is under way many suggestions are already beginning to pour in. Previously there was no department to handle this mass of detail. Most of it went to Mr. Alberger and his assistant. The bureau of public relations will fill this gap.

Thomas J. Lynch Will Resign

Thomas J. Lynch, assistant general manager and later general manager of the Schenectady Railway, Schenectady, N. Y., since July, 1923, has tendered his resignation, to take effect on May 1. Mr. Lynch came to the company from the United Traction Company, Troy division, living then, as he does now, in Albany. At the time of the reorganization of the company last October Mr. Lynch was requested to remain and did so, though at some sacrifices to his personal interests. For the present Mr. Lynch is devoting his time to personal interests which he has in his home city and will later announce plans which he now has under consideration.

Mr. Danforth Resigns

R. E. Danforth has resigned as vice-president and general manager of the Public Service Railway, Newark, N. J. Mr. Danforth has been spending the winter in South Carolina and expects to take an extended vacation before engaging again in active business. During Mr. Danforth's absence M. R. Boylan has been acting general manager of the Public Service Railway.

Frank Hampshire has been appointed master mechanic of the Binghamton Railway, Binghamton, N. Y. In that capacity he succeeds H. M. Rhoda, who left the company on March 1 to take up duties under Charles S. Banghart, vice-president of the Richmond Light & Railroad Company, Staten Island, N. Y. Mr. Hampshire was first employed by the Binghamton Railway in November, 1907, as a night car cleaner. He was promoted to the day force as a car repairer during the spring of the following year, and in August, 1916, became night carhouse foreman. He resumed repair work within a couple of months and became assistant master mechanic to Mr. Rhoda in February, 1917. He remained in that capacity until Mr. Rhoda resigned March 1. Mr. Hampshire is an Englishman by birth.

H. H. Couzens to Brazil

General Manager of Toronto Transportation Commission Appointed to Canadian Holding Company

H. H. Couzens, general manager of the Toronto Transportation Commission, operating the civic railway lines in Toronto, and the Toronto Hydro, is to become vice-president of the subsidiary companies of Brazilian Traction, Light & Power Company, controlled by Canadian interests. He will make his headquarters at Rio de Janeiro.

Since Mr. Couzens assumed the duties of his present position, Sept. 1, 1921, Toronto's transportation system has been almost entirely rehabilitated. When the city took over the lines of the Toronto Railway the system was in exceedingly bad physical shape due to neglect during the purchase negotiations. Under the leadership of Mr. Couzens the Transportation Commission at once began the work of rehabilitation.

H. H. Couzens

Born in England in 1877, Mr. Couzens received his education at the Independent College at Taunton, England, after which he served as a pupil in mechanical and electrical engineering with Allen & Sons, Taunton, and the Taunton Corporation Electrical Works. After holding a number of engineering positions he became manager and engineer of the West Ham Corporation Electric Supplies in 1909, and three years later accepted a similar position with the Hampstead Borough Council. He held the latter position only one year, resigning at the end of 1912 to become general manager of the Toronto Hydro-Electric system, with which he took up his duties early in 1913. He continued in the latter position until the Toronto Transportation Commission took over the local street railway, when he assumed his present work.

At the concluding meeting of the Canadian Electric Railway Association, held on June 30, 1923, at Toronto, Mr. Couzens was elected president of the association.

Sir Alex. Mackenzie is president of Brazilian Traction, Light & Power Company and Messrs. E. R. Wood, R. C. Brown and Miller Nash of Toronto are among the vice-presidents. Sir Henry Pellatt and Sir Thomas White are among the directors. The company was formed to link the São Paulo Tramway, Light & Power Company, Rio de Janeiro Tramway, Light & Power Company, and São Paulo Electric Company. It also controls the Brazilian Telephone Company.

Personnel Changes at Knoxville

The Knoxville Power & Light Company, Knoxville, Tenn., has promoted two of its officers and has transferred the office of the treasurer of the company to New York City. H. C. Ray, formerly assistant treasurer, has been elected treasurer, due to the resignation of C. J. Pleming, who will engage in private business. Mr. Ray will conduct the affairs of the office of treasurer in New York.

Chester A. Briggs, present auditor of the company, has been elected secretary and in addition to the duties of his new office will retain his old position.

Jesse W. Bye, Jr., was elected to the position of assistant treasurer. He has formerly been cashier of the company and will continue to remain in Knoxville.

H. U. Wallace, formerly assistant general manager of the Arkansas Central Power Company, Little Rock, Ark., has been appointed assistant general manager.

Frank J. Jones, formerly engineer way and structures, has been appointed chief engineer to succeed James Link, who has been transferred and appointed superintendent of the electric department.

H. M. Rhoda, formerly master mechanic of the Binghamton Railway, Binghamton, N. Y., resigned from that property on March 1 to take up duties under Charles S. Banghart, vice-president of the Richmond Light & Railroad Company, Staten Island, N. Y. At one time Mr. Rhoda was master mechanic of the Long Island Electric Railway, Jamaica, L. I. and prior to that served in the capacity of assistant master mechanic of the Reading Transit Company, Reading, Pa. He was also at one time identified with the Trenton & Mercer County Traction Corporation.

Obituary

John W. Boyle

John W. Boyle, Utica, N. Y., a pioneer operator of electric railway properties in central New York, died suddenly on March 27 in Los Angeles. It was in 1886 that Mr. Boyle first became interested in street railroad management when he filled the position of attorney for the Utica Belt Line, then just organized. Later when the Thomson-Houston Company secured control in 1889 he was made vice-president and general attorney. In 1894, upon the reorganization of the line, which he brought about, he was made president. Mr. Boyle disposed of his interests in the Utica Belt Line Street Railroad in 1901 and retired from the company. He first practiced law in Utica with Waterman & Hunt, but later followed his profession without a partner. He was born in Scotland in 1851.

Manufactures and the Markets

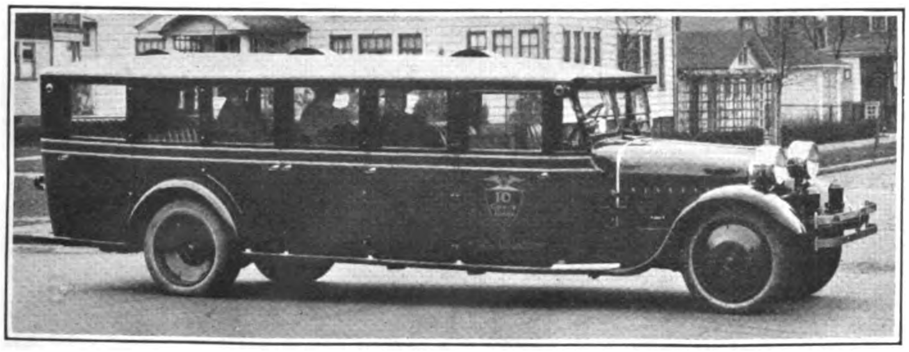
News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Bus Market Active

Forty-two Vehicles for Akron—Railway Bus Purchases Approximating $2,000,000 Are Indicated

Contracts just placed by the Northern Ohio Traction & Light Company, Akron, Ohio, for $300,000 of automotive equipment again focus attention on the constantly increasing use of the bus by the electric railways. As noted elsewhere in this issue that order includes forty-two vehicles. In it are included Whites, Macks, Reos and Masons. Moreover, part of the equipment is intended to be used in city service and part in interurban.

This in itself is more significant, perhaps, than would at first appear, although so far as the Northern Ohio Company is concerned it does not mark a new departure in its practices. That order properly is regarded as mighty significant. It is. But after all, it stands apart as news largely because it bulks big as a single order. It is only one of many noted recently in the Electric Railway Journal. That record is not complete. It does not pretend to be. But it is a pretty fair criterion. Moreover, the trend which it indicates toward the constantly growing use of the bus by the railways is substantiated by the reports from the manufacturers themselves with respect to inquiries for buses.



Duplicate of Cleveland Automobile Show Job Just Delivered to the Pennsylvania-Ohio Electric Company

Among the large prospective orders is one in connection with the Philadelphia Rapid Transit Company bus development. It is understood in this connection that the company is likely to buy about 120 vehicles. It is understood that the Trenton, Bristol & Philadelphia Street Railway is considering the purchase of five or ten vehicles. The Washington, Baltimore & Annapolis is understood to be considering the purchase of buses. Another company in the East reported likely to be in the market is the Atlantic Coast Electric Railway. now included in the system of the Eastern New Jersey Power Company. The Third Avenue Railway, New York, is also understood to contemplate the purchase of five buses. The New Bedford Street Railway has recently purchased two Whites and one Mack and is reported to be in the market for additional vehicles.

Among orders reported placed are five Garfords and one Yellow Coach for the Springfield Street Railway, Springfield, Mass.; ten Fageols for the Trenton & Mercer County Traction Corporation in addition to three already delivered; five Garfords for the Chicago, South Bend & Northern Indiana Railway; six Fageols for the Indiana, Columbus & Eastern Traction Company and six Yellow Coaches for the Houston Electric Company.

This last is among the jobs already delivered. The Houston buses will seat twenty-nine passengers. They will be used in service put in operation to replace jitneys under the terms of the recent settlement ordinance there.

As for other orders completed the White company reports a brand new DeLuxe job just delivered to the Pennsylvania-Ohio Electric Company at Youngstown. This is a duplicate of "Miss Rosalie," the White bus displayed in the Cleveland Automobile Show. The body was built by Bender. The White company also reports having just delivered nine new jobs to the P-O—the DeLuxe coach just mentioned, and eight city pay-enter type that will go into the service of the Youngstown Municipal Railway. The P-O also has ten city pay-enter White buses on order. The White company also figured in the Akron order to the extent of ten model 50-A buses with Kuhlman bodies. These buses will go into service in Akron, making a total of 34 White buses being operated by the N.O.T.L. in the city of Akron and a grand total of 54 Whites in the service of that railway company.

There is no need to repeat at this time the figures of the Journal with respect to its recent automotive survey for 1923. Significant as was that record of the trend of events with respect to the increased use of the bus by the railways, it appears to have been very conservative in the face of the development so far this year of which there is definite knowledge.

G. E. Has Good Year

Sales for 1923 Increased Nearly $30,000,000—Unfilled Orders at End of 1923 $87,112,000

Orders received by the General Electric Company during the year 1923 were $304,199,746, compared with $242,739,527 in the year 1922, an increase of 25 per cent. The profit available for dividends for 1923 was $33,525,118 and the surplus after cash dividends $18,579,423. The surplus as of Dec. 31, 1923, was $82,762,095. The surplus in 1922 in excess of cash dividends was $12,157,391. Unfilled orders at the end of 1923 were $87,112,000, compared with $76,220,000 in 1922.

Export Business Good

The export business is conducted by the International General Electric Company, Inc. The total of all orders received by the International Company during the year was $21,743,000, compared with $21,536,000 during 1922. The net sales billed were $22,371,526 during 1923. The International Company's business was conducted at a profit available for dividends of $2,469,463, compared with $2,265,477 in 1922. Dividends of $700,000 were paid during 1923, of which the General Electric Company received $669,372.

During the year distinct notable improvements were made in internal rearrangement and production processes and methods, which, notwithstanding increased cost of labor and material, have resulted in lower costs, and these have been reflected from time to time in reduced selling prices.

One of the most important new investments of the year was the purchase of a majority of the common stock of the Canadian General Electric Company, Limited. It is the intention to preserve essentially the Canadian character of this company.

Important Mechanical Advances Made

Inventories in factories and warehouses and on consignment have been valued at cost or market, whichever was lower. After deducting adequate reserves, they are carried at $83,746,031 compared with $75,334,561 at the end of 1922.

Notes and accounts receivable are carried at $37,987,339, compared with $35,154,419 at the end of 1922. Collections were good and credit losses very small.

The cash balance, including temporary investments in short term obligations of the United States Government, was $91,205,620 at Dec. 31, as compared with $85,341,538 at the close of the previous year. The company has no notes payable, or any obligations bearing its indorsement outstanding.

In carrying out the provisions of the Charles A. Coffin Foundation various awards were made. Thus in October, 1923, the committee of the American Electric Railway Association awarded the Charles A. Coffin medal to the Chicago, North Shore & Milwaukee Railroad and $1,000 to the Employees Mutual Benefit Association of that company. In this connection the company expresses the hope that the awards of the Charles A. Coffin Foundation for achievements on the part of companies and individuals will serve as appreciation and recognition of meritorious and distinguished service to the electrical industry.

The company reports important progress during the year from the work of the engineering department and research laboratory. In addition to the improvement of existing designs many new designs have been developed and placed on the market. These include standard lines of induction motors, steam turbines up to 60,000 kw. capacity, designed for steam pressure of 600 pounds, superheated to a temperature of 750 degrees F., and special turbines for 1,200 pounds steam pressure.

The Emmet mercury vapor process has been installed and is in successful operation at the power house of the Hartford Electric Light Company. This system is regarded to represent an important improvement in prime mover efficiency over present standard steam boiler and turbine practice.

Rolling Stock

Pacific Electric Railway, Los Angeles, Cal., has purchased 1,350 additional freight cars for $3,000,000, with delivery specified at the rate of 150 cars average per week. The first lot of the new freight cars will probably be received early in April. This order is a little more than twice the size of a contract for freight equipment made during the past year. The final delivery of this 650-car order has just been completed. The total expenditure for freight equipment by the company the past year was $4,950,000.

East St. Louis Company Improving Shop

As part of a general program for modernizing its shop equipment, the East St. Louis & Suburban Railway, East St. Louis, Ill., has made a number of improvements to existing facilities and added a number of new machine tools. Individual motor drive is being gradually installed to replace line shafts and belt equipment. It is expected that by the end of the current year practically all of the machinery in the Win Stanley shop will be individually motor driven.

A new 48-in. swing, double-head wheel lathe has been added for turning steel wheels. In the machine shop a motor-driven hacksaw which was recently installed has proved to be particularly useful. A molding machine has been added in the wood mill and a new electric welder has been added for reclaiming broken or worn parts.

In addition, a survey of the pipe work which is required in the routine maintenance of equipment has led to the installation of a new motor-driven pipe cutting and threading machine. It is expected that the addition of this machine will save not only a large part of the time and labor incident to threading the large amount of pipe used for maintenance work, but will also make a considerable saving.

Track and Line

Madison Railways, Madison, Wis., has completed preparations for the double tracking of nearly the entire length of its Wingra Park-Fair Oaks Street line. Soon double tracking and paving work will start from Regent Street on Breeze Terrace to University Avenue, thence down University Avenue to Chester Street. On University Avenue the tracks will be lowered to conform with the present grade.

Wisconsin Valley Electric Company, Wausau, Wis., has been petitioned by property owners on the northwest and east side sections of the city to construct a loop north of Clarke Street.

Fresno Interurban Railway, Fresno, Cal., has received permission from the commission to construct its track at grade across Academy, Madsen, Newmark, Zediker and Riverbend Avenues in the County of Fresno.

Pacific Electric Railway and **Southern Pacific Railroad, Los Angeles, Cal.,** have announced that plans have been completed for a proposed expenditure of $1,750,000 to construct a huge joint freight classification and distribution yards at Watson Station on the Los Angeles-San Pedro Line.

Trade Notes

Charles Longenecker, formerly sales engineer with the Bonnot Company at Canton, Ohio, has become associated with the Combustion Engineering Corporation, 43 Broad Street, New York. Mr. Longenecker was one of the first men to specialize in pulverized fuel and he has been active in this field for many years past. His efforts have been directed particularly along the line of industrial application to both boilers and furnaces. In this new connection he will be identified with the recently created industrial department of the Combustion Engineering Corporation. This department, in charge of H. D. Savage, will specialize in the application of pulverized fuel to industrial work of all kinds.

William Arthur has arranged with J. M. Pneuman to represent in the Midwest territory the Arthur Power-Saving Company, of which he is general manager. As reported in the March 29 issue of ELECTRIC RAILWAY JOURNAL, J. M. Pneuman has entered the commercial field as manufacturers' agent for electric railway supplies and equipment, operating from Berea, Ohio, near Cleveland. The Arthur Power-Saving Recorder Company is at New Haven, Conn. More than 12,000 of the Arthur power-saving recorders are now in use. Recent improvements in the apparatus have made them dust-proof and tamper-proof. Further, all hand winding of the clock mechanism has been eliminated, as the process is now entirely automatic.

New Advertising Literature

The Johns-Pratt Company, Hartford, Conn., has issued a circular called "Going Underground?" It states that more than 1,200 different kinds of Noark underground boxes have been produced.

James H. Channon Manufacturing Company, Chicago, Ill., has issued a pamphlet on Sherardizing "the most modern and thorough method of rust-proofing in use today."

ELECTRIC RAILWAY MATERIAL PRICES—APRIL 1, 1924

Metals—New York

Copper, electrolytic, cents per lb.	13.562
Lead, cents per lb.	8.975
Nickel, cents per lb.	26.00
Zinc, cents per lb.	6.50
Tin, Straits, cents per lb.	50.25
Aluminum, 98 to 99 per cent, cents per lb.	27.50
Babbitt metal, warehouse, cents per lb.:	
Fair grade	60.00
Commercial	28.00

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads	$4.20
Somerset mine run, Boston	2.125
Pittsburgh mine run, Pittsburgh	2.125
Franklin, Ill., screenings, Chicago	2.075
Central, Ill., screenings, Chicago	1.675
Kansas screenings, Kansas City	2.50

Track Materials—Pittsburgh

Standard Bessemer steel rails, gross ton	$43.00
Standard open hearth rails, gross ton	43.00
Railroad spikes, drive, Pittsburgh base, cents per lb.	3.00
Tie plates (flat type), cents per lb.	2.60
Angle bars, cents per lb.	2.75
Rail bolts and nuts, Pittsburgh base, cents, lb.	4.125
Steel bars, cents per lb.	2.30
Ties, white oak, Chicago, 6 in.x8 in.x8½ ft.	$1.70

Hardware—Pittsburgh

Wire nails, base per keg	3.00
Sheet iron (28 gage), cents per lb.	3.75
Sheet iron, galvanized (28 gage), cents per lb.	4.90
Galvanized barbed wire, cents per lb.	3.80
Galvanized wire, ordinary, cents per lb.	2.75

Waste—New York

Waste, wool, cents per lb.	.15
Waste, cotton (100 lb. bale), cents per lb.:	
White	12–18
Colored	9–14

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), per gal.	$0.93
White lead (100 lb. keg), cents per lb.	12.25
Turpentine (bbl. lots), per gal.	$1.01
Car window glass, (single strength), first three brackets, A quality, discount*	84.0%
Car window glass, (single strength), first three brackets, B quality, discount*	86.0%
Car window glass, (double strength) all sizes, A quality, discount*	85.0%
Putty, 100 lb. tins, cents per lb.	4–6

*These prices are f.o.b. works, boxing charges extra.

Wire—New York

Copper wire base, cents per lb.	16.00
Rubber-covered wire, No. 14, per 1,000 ft.	$6 75
Weatherproof wire base, cents per lb.	18.00

Paving Materials

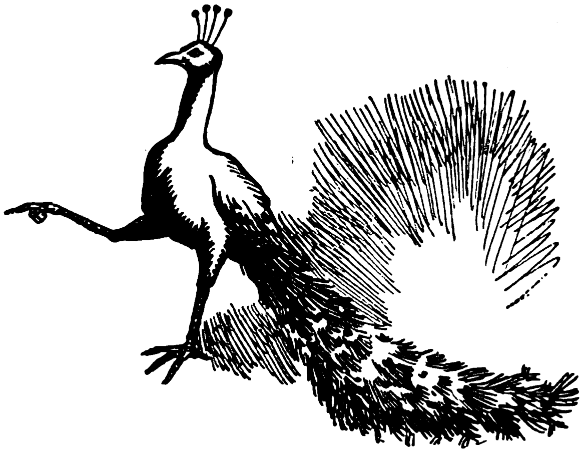
Paving stone, granite, 4x8x4, f.o.b.	
Chicago, dressed, per sq.yd.	$3.60
Common, per sq.yd.	2.95
Wood block paving 3½, 16 treatment, N. Y., per sq.yd.	2.56
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots	54.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd.	1.85
Cement, Chicago consumers' net prices, without bags	2.20
Gravel, ¾-in., cu.yd., f. o. b. N. Y.	2.00
Sand, cu.yd., N. Y.	1.25

Old Metals—New York and Chicago

Heavy copper, cents per lb.	10.75
Light copper, cents per lb.	9.25
Heavy brass, cents per lb.	6.75
Zinc, old scrap, cents per lb.	4.00
Yellow brass, cents per lb. (heavy)	6.00
Lead, cents per lb (heavy)	7.25
Steel car axles, Chicago, net ton	$18.25
Cast iron car wheels, Chicago, gross ton	17.25
Rails (short), Chicago, gross ton	18.75
Rails, (relaying), Chicago, gross ton	26.50
Machine turnings, Chicago, gross ton	8.75

Don't use the reverse!

It's mighty hard on the motors and controllers. It puts a severe strain on all the the electrical equipment. And it's likely to result in blowing fuses or circuit breakers and then you're worse off than ever.



PEACOCK BRAKES

will stop the car as quickly!

A few swift turns of the hand-wheel and the sure grip of the Peacock Brake takes hold with maximum braking power—a retarding grip which is more effective even than spinning wheels backward with reversed motors.

That's what a hand brake is for—i.e. to stop the car as quickly as any other means, if some emergency renders the air brakes inoperative. But not every hand-brake will do it. Peacock Brakes are made to stop the car under emergency conditions.

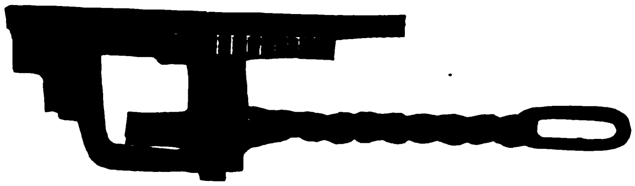
"The Peacock Staffless"

PEACOCK Staffless Brakes

Especially adapted for the modern, light-weight safety car, both single and double-truck. Minimum platform space, light-weight, high braking power.

PEACOCK Improved Brakes

Made in suitable sizes and styles for heavier city cars, interurban and rapid-transit cars. Exclusive Peacock features—the eccentric drum and the automatic stop.



Peacock Improved Brake

National Brake Co., Inc.

890 Ellicott Sq., Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Company, Limited, Montreal, Canada

[illegible] Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

The J. G. White Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants, Steam and Electric Railroads, Buildings and Industrial Plants, Transmission Systems.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation Management
52 Vanderbilt Ave., NEW YORK

A. L. DRUM & COMPANY
Consulting and Constructing Engineers
VALUATION AND FINANCIAL REPORTS
RATE STUDIES FOR PRESENTATION TO PUBLIC SERVICE COMMISSIONS
CONSTRUCTION AND MANAGEMENT OF ELECTRIC RAILWAYS
230 South Clark Street, Chicago, Ill.
215 South Broad Street, Philadelphia, Pa.

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation, Studies on Financial and Physical Rehabilitation Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. Richmond, Va.
Established Feb. 1913.

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

J. ROWLAND BIBBINS
Engineer—927 Fifteenth St., WASHINGTON
TRANSPORTATION SURVEYS
Organized Traffic Relief and Transit Development
Co-ordinating Motor Transport, Railroad and City Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

Parsons, Klapp, Brinckerhoff & Douglas

WM. BARCLAY PARSONS — H. M. BRINKERHOFF
EUGENE KLAPP — W. J. DOUGLAS

Engineers—Constructors—Managers

Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports

CLEVELAND
1570 Hanna Bldg.

NEW YORK
84 Pine St.

Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

ARCHBOLD-BRADY CO.

Engineers and Contractors SYRACUSE, N. Y.

Byllesby
Engineering & Management Corporation

208 S. La Salle Street, Chicago
New York Tacoma

DAY & ZIMMERMANN, INC.
ENGINEERS

Design, Construction
Reports, Valuations, Management

NEW YORK PHILADELPHIA CHICAGO

C. B. BUCHANAN, President — W. H. PRICE, JR., Sec'y-Treas. — JOHN F. LAYNG, Vice-President

BUCHANAN & LAYNG CORPORATION

Engineering and Management, Construction,
Financial Reports, Traffic Surveys
and Equipment Maintenance

BALTIMORE
825 Equitable Bldg.

Phone:
Hanover 2142

NEW YORK
49 Wall Street

Dwight P. Robinson & Company
Incorporated

Design and Construction of
Electric Railways, Shops, Power Stations
125 East 46th Street, New York

Chicago Youngstown Atlanta Philadelphia
Los Angeles Montreal Rio de Janeiro

HUMAN ENGINEERING

Railway Audit & Inspection Co., Inc.
Fourth and Chestnut Streets, Philadelphia

THE P. EDWARD WISH SERVICE

50 Church St.
NEW YORK

Street Railway Inspection
DETECTIVES

131 State St.
BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal w uld be appreciated.

WIRING FOR LIGHT AND POWER
CROFT

Just Out!
New 1924 Edition
of this
Standard Wiring
Guide

New Fourth Edition
CROFT'S
Wiring for Light and Power
By TERRELL CROFT
Consulting Engineer

Fourth Edition, completely revised, 562 pages, pocket size, flexible, 400 illustrations, $3.00 net, postpaid.

This standard book on wiring has been completely rewritten, brought strictly up-to-date and made to conform with the latest National Electrical Code.

Covers Every Type of Wiring Job

It explains clearly, in simple language, how to instal wiring and apparatus for practically all services under practically all conditions, illustrated by many new explanatory drawings and diagrams. It covers the latest practice and tells how to make installations that will be electrically safe and mechanically correct.

Explains and Conforms with Code

It gives you clear, simple explanations of what the National Electrical Code rulings are, gives the reasons for these rulings and shows exactly how to meet them.

Complete—Read These Headings

CONTENTS—General—Outside Work—Services—Wiring Methods—Conductors—Outlet Boxes and Cabinets—Automatic Protection of Circuits and Appliances—Grounding—Rotating Machinery and Its Control Apparatus—Transformers: Under 600 Volts—Switches—Switchboards and Panelboards—Fixtures, Lamp Sockets and Receptacles, Plug Receptacles—Lamps—Heating Appliances—Resistance Devices—Storage or Primary Batteries—Lightning Arresters—Cranes and Hoists—Elevators—Extra-Hazardous Locations—Garages—Motion Picture Studios—Motion Picture Projectors and Equipment—Organs—Radio Equipment—Signs and Outline Lighting—Theatres; Including Motion Picture Houses—Small Isolated Plants—Systems and Voltages of Over 600 Volt—Signal Systems.

Examine this new book for 10 days free

McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y.

You may send me on 10 days' approval Croft's Wiring for Light and Power, Fourth Edition, $3.00 net, postpaid. I agree to pay for the book or return it postpaid within 10 days of receipt.

Regular subscriber to Electric Railway Journal?................

Member of A. I. E. E.?..

Signed ....

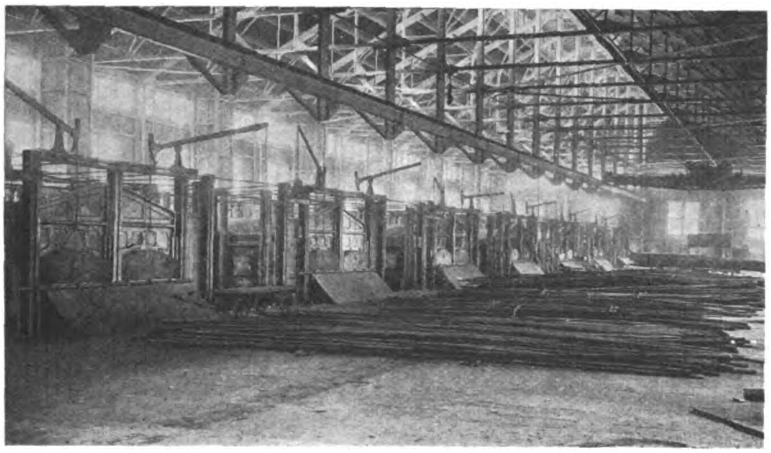
Address ....

Official Position..

Name of Company..

(Books sent on approval to retail purchasers in the U. S. and Canada only.) E. 4-5-24

HEAT TREATED—
TROLLEY POLES



PRIOR to the last cold drawing operation every "SHELBY" Seamless Steel Trolley Pole is given a special heat treatment. This is a very important part of the manufacture of a trolley pole. By this treatment the structure of the metal is left in the finest condition after having passed through the cold drawing operation. Thus every pole is ready to meet the severe conditions of service.

The elastic limit of these poles averages from 60,000 to 70,000 pounds per square inch. They are made in two regular designs—A and B. Design A for ordinary service conditions and where a light pole is practical and design B intended for heavier service.

Both types of poles are fully described in our booklet—The "SHELBY" Seamless Cold Drawn Steel Trolley Pole. A copy sent upon request.

NATIONAL TUBE COMPANY
Frick Building, Pittsburgh, Pa.
DISTRICT SALES OFFICES IN THE LARGER CITIES

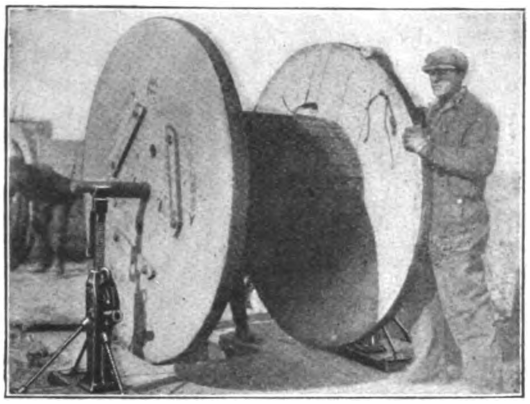
"Jack 'em out" SIMPLEX "Jack 'em out"

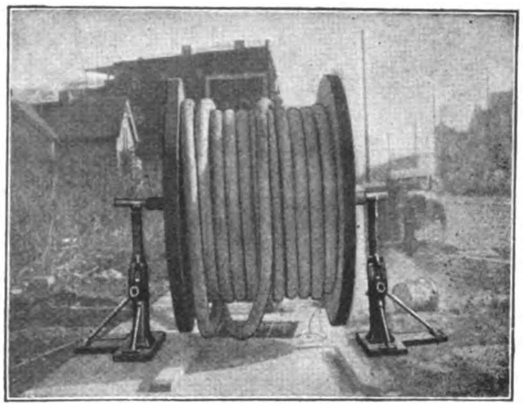
JACKS

JACKS

Simplex Cable Reel Jacks
Do Every Operation in Minimum Time
and Therefore at Mininum Expense

Do *Yours*?





Simplex Cable Reel Jacks
Are Proven Time Savers

From Start to Finish of a Cable Pulling Job, the multiplied man power of quick acting Simplex Cable Reel Jacks saves time and money at every step.

You can be sure that Simplex Cable Reel Jacks will not tip over from an accidental side pull thereby wasting time, damaging the cable or injuring employees.

Distributed by

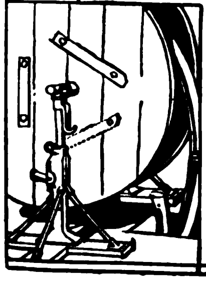
Western Electric Company

Offices in 47 Cities

Manufactured by

Templeton, Kenly & Co., Limited

Established 1899 Sole Manufacturers
Chicago Ill. U.S.A.



"INDIANAPOLIS"

Is Saving Electric Railways Millions of Dollars Annually

Don't spend a dollar on your track
(New or old)
Until you get "INDIANAPOLIS"
Prices for Comparison

"INDIANAPOLIS" Economy Products

"They cost less"

Solid Manganese Crossings
also Frogs, Mates, and Tongue-Switches
(15 years of specializing has produced a product UNEXCELLED, and LOWEST in COST, quality considered)

Electric Welders
Thoroly Efficient
(Economical and never out of COMMISSION)

Welded Rail Joints
(A COMBINATION OF EVERY ESSENTIAL FACTOR in Rail Joining and Bonding)

Welding Steel Electrodes
Absolutely Dependable

Electric Welding Supplies
Hoods, Lenses, Carbons, Etc.

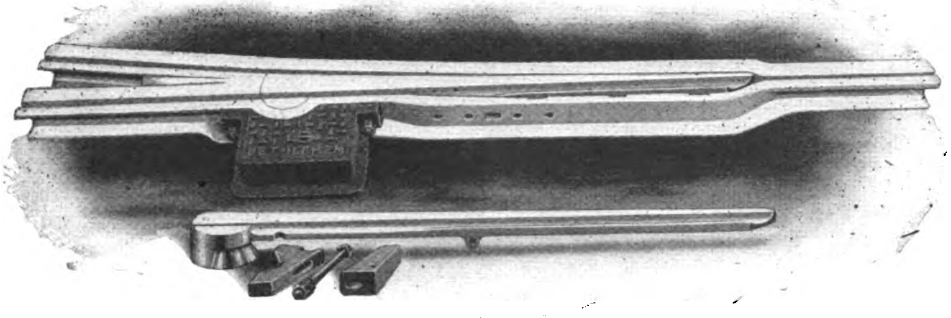
Better design
Higher quality
Longer service
Lower prices

The Indianapolis Switch & Frog Co.

SPRINGFIELD, OHIO

Los Angeles San Francisco Kansas City Boston

Track Recommendations for 1924

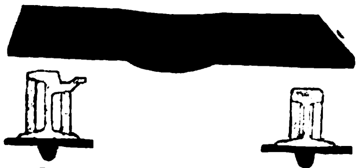


Solid Manganese Tongue Switch, Design 905

This switch is of the improved "Big Pin" type, providing maximum bearing surface or support at the heel. The positive action of hold-down block resists any tendency of the tongue to rock under side thrust, or kick up at the point due to the pounding action of car wheels. The extra large box at the heel of the tongue provides ample room for easy adjustment and quick cleaning.

Hard Center Mate, Iron Bound Type, Design 923

The mate illustrated above is provided with a heavy manganese steel wearing plate three inches thick held firmly to the carefully machined bed of the mate body by heavy stud bolts of heat-treated Mayari chrome-nickel steel. The entire construction is unusually heavy and substantial.

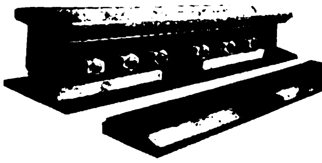


Center Rib Base Plate

This design provides the maximum stiffening reinforcement directly under the rail joint. It supports the joint and prevents battering or cupping of the rail ends.

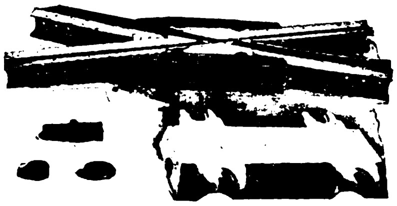
Abbot Base Plate

This plate serves the same purpose as the Center Rib. In this case the reinforcement is on each side instead of in the center.



Machine Fitted Joint, Design 983

Joint illustrated above is accurately machined top and bottom to fit any rail section. The special bevel top and bottom is provided for electric arc welding.



Hard Center Frog, Iron Bound Type, Design 942

This hard center frog is of the same construction and offers the same advantages as the mate described above. Particular attention is called to the large bearing area of the plate.

Rolled Steel Alloy Crossing, Design 960

This rolled steel crossing is made of a special rolled Mayari chrome-nickel steel rail. The head of the rail is rolled full, the flangeways machined to any desired depth and then heat-treated to withstand wear. The rails are iron-bound into one solid piece, flange bearing throughout. This crossing may be welded after wear has developed.

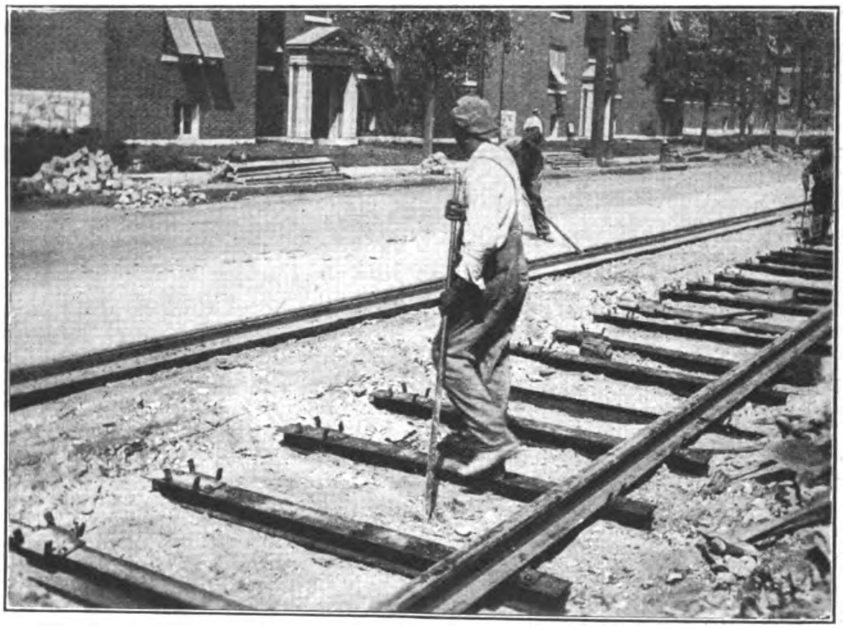
BETHLEHEM STEEL COMPANY, ***General Offices:*** **BETHLEHEM, PA.**

Sales Offices:

New York Buffalo Boston Cleveland Philadelphia Detroit Baltimore Cincinnati Washington Chicago St. Louis Atlanta San Francisco Pittsburgh

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM



Tracks in St. Louis renewed in modern, efficient manner

The photograph illustrates Carnegie Steel Cross Ties in track renewal work in St. Louis.

The former concrete track was used as a bed, enough wood ties having been removed to permit of Steel Tie installation.

Then the whole structure was concreted to level of top of Steel Ties. Result—an economical and thoroughly satisfactory track.

Trebled capacity for the manufacture of Steel Cross Ties assures prompt delivery.

Booklet—Steel Cross Ties—on request

Carnegie Steel Company
GENERAL OFFICES—CARNEGIE BUILDING
434 FIFTH AVENUE
PITTSBURGH, PA.

1689

L. B. FOSTER CO.,
630 PARK BUILDING,
PITTSBURGH, PA.

Phone, Write, Wire

RELAYING RAILS
NEW RAILS

Immediate shipment from warehouse stock

1 Ton or 1000

All Rails and Track Materials absolutely guaranteed and shipped subject to inspection and approval at destination.

BUY GUARANTEED RELAYING RAILS AND SAVE 30% TO 50%

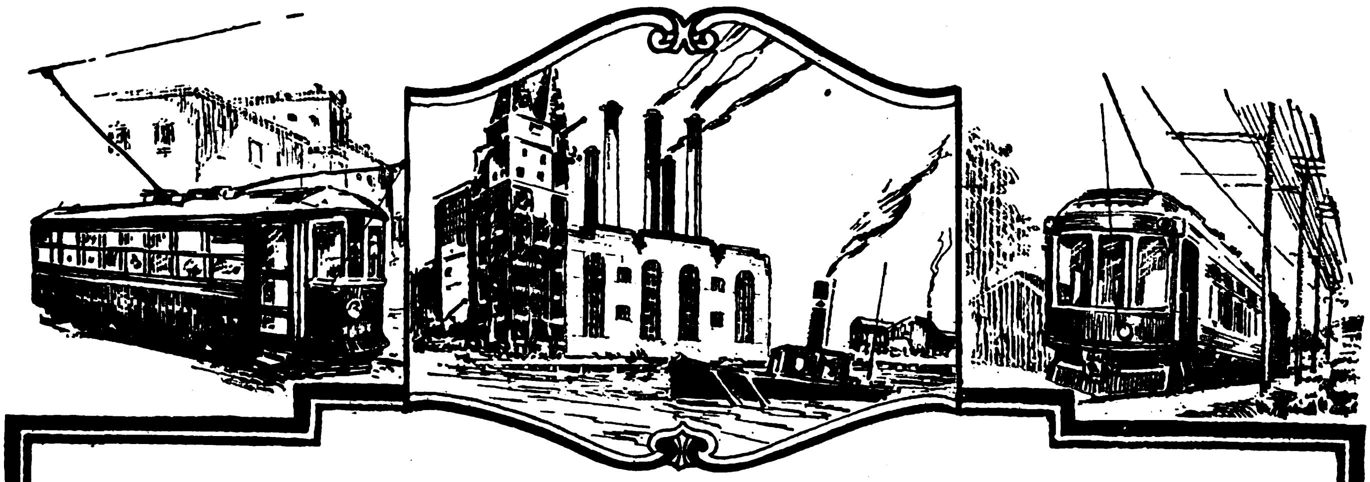
New Rails
New Frogs—Switches
New Splices—Bolts—Spikes
New Tie Plates—Rail Braces

CENTRALLY LOCATED WAREHOUSES
Pittsburgh, Pa. — Jersey City, N. J.
Hamilton, O. — Baltimore, Md.

L·B·FOSTER CO·
PITTSBURGH, PA.- NEW YORK CITY.

The solid, substantial character of COLLIER SERVICE has placed it high among those permanent organizations recognized as National Institutions

Barron G. Collier INCORPORATED



Now!

Is the time of the year to begin changing over to:

TEXACO *Summer* Electric Car Oil
TEXACO *Summer* Air Compressor Oil
TEXACO *Summer* Gear Lubricant
TEXACO *Summer* Curve Oil
TEXACO *Summer* Curve Grease

And here is why:

All oils tend to become a little lighter; a little more fluid in warm weather.

The fluidity of oil is expressed in terms of viscosity. Viscosity varies with temperature.

In the application of lubricants to street cars, it is the "Operating Temperature" that counts.

As the weather gets warm the oils you used all winter will thin out. They will not feed at the same rate.

You can't change the temperature, but you can change the oils to compensate.

But weather doesn't change at a given date, so here's what we recommend:

Compensate gradually. Begin now adding steadily small quantities of HEAVIER oils to the lubricants now on the cars. This will gradually raise the viscosity so that by May 1st the change over will be completed.

Then all the time, even in the "dog days,"* you will be fully protected by these carefully refined Texaco Lubricants.*

As conditions vary throughout the country, watch the thermometer more than the calendar and you will not be caught off guard.

We have worked out an interesting and economical method of making this change on roads all over the country and we will consider it a privilege to have our Texaco Lubrication Engineers discuss it with you in person.

There Is a Texaco Lubricant for Every Purpose

TEXACO

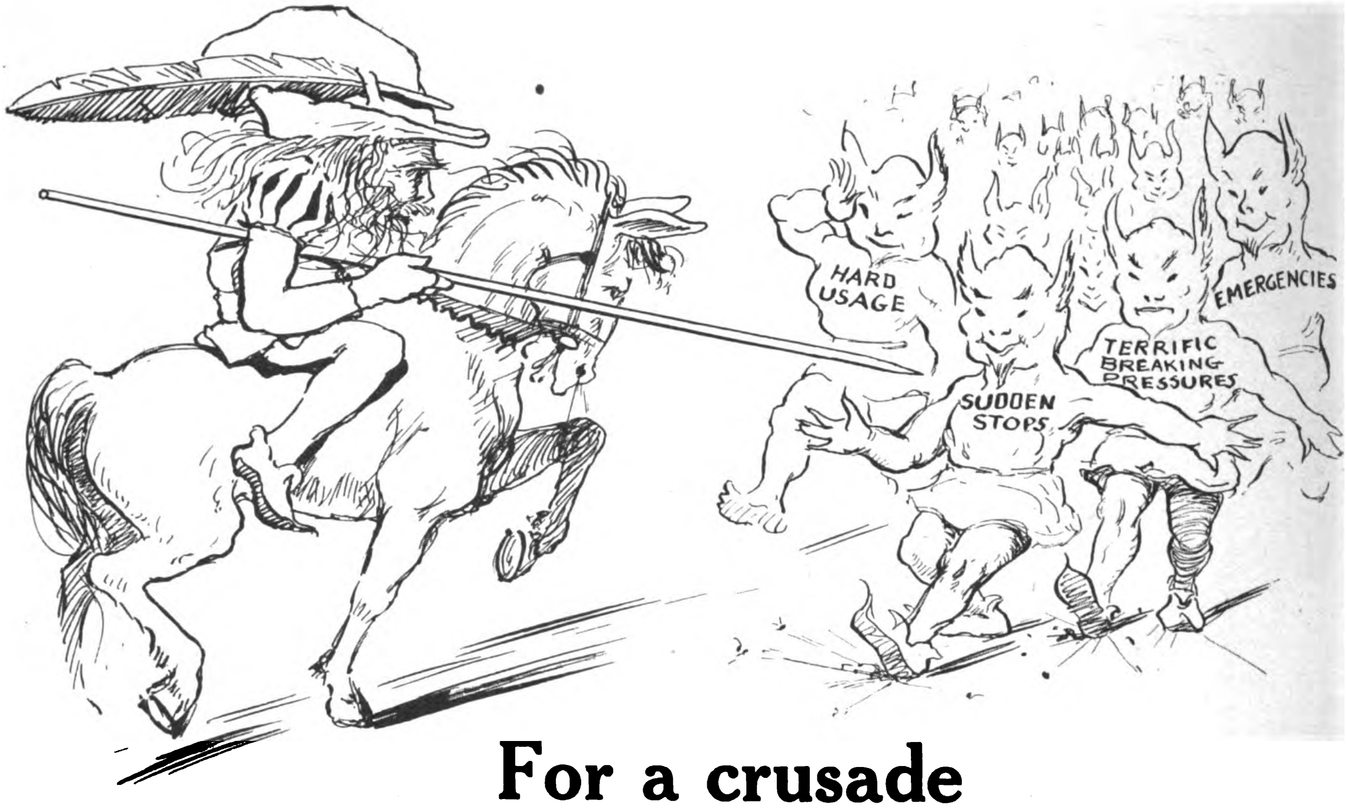
THE TEXAS COMPANY

[illegible]

TEXACO

---

*In the late Fall reverse the process gradually lowering the viscosity of the lubricants so that under the cold of winter the oils will have the proper fluidity.



For a crusade against high maintenance

BOYERIZE!

Even the trusty steel of olden times couldn't stand up to the strains of a brake rigging job on city cars.

Only specially hardened steel can live at all. Only Boyerized steel with its glossy armor plate surface can give full service and protection.

Experience has proved that it actually outwears case-hardened steel three to four times.

Choose from the long wear line

It's Boyerized!

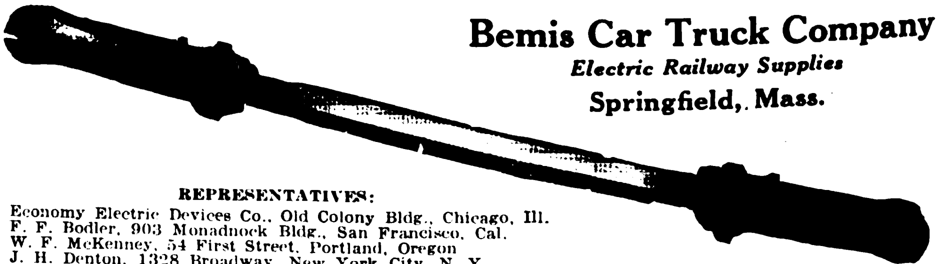
- **Brake Pins**
- **Brake Hangers**
- **Brake Levers**
- **Pedestal Gibs**
- **Brake Fulcrums**
- **Center Bearings**
- **Side Bearings**
- **Spring Post Bushings**
- **Spring Posts**
- **Bolster and Transom Chafing Plates**
- **McArthur Turnbuckles**
- **Manganese Brake Heads**
- **Manganese Truck Parts**
- **Bushings**
- **Bronze Bearings**

The McArthur Turnbuckle

You won't have to refit the rigging with new turnbuckles, if you specify McArthur Turnbuckles in the first place. They will last as long as the truck itself.

More than that—the old-style jam-nut idea has been scrapped, and an efficient spring-equipped, split-clamp principle has been substituted. Now it only takes a pocket-wrench and a moment's time to make an adjustment, and tighten it up to stay.

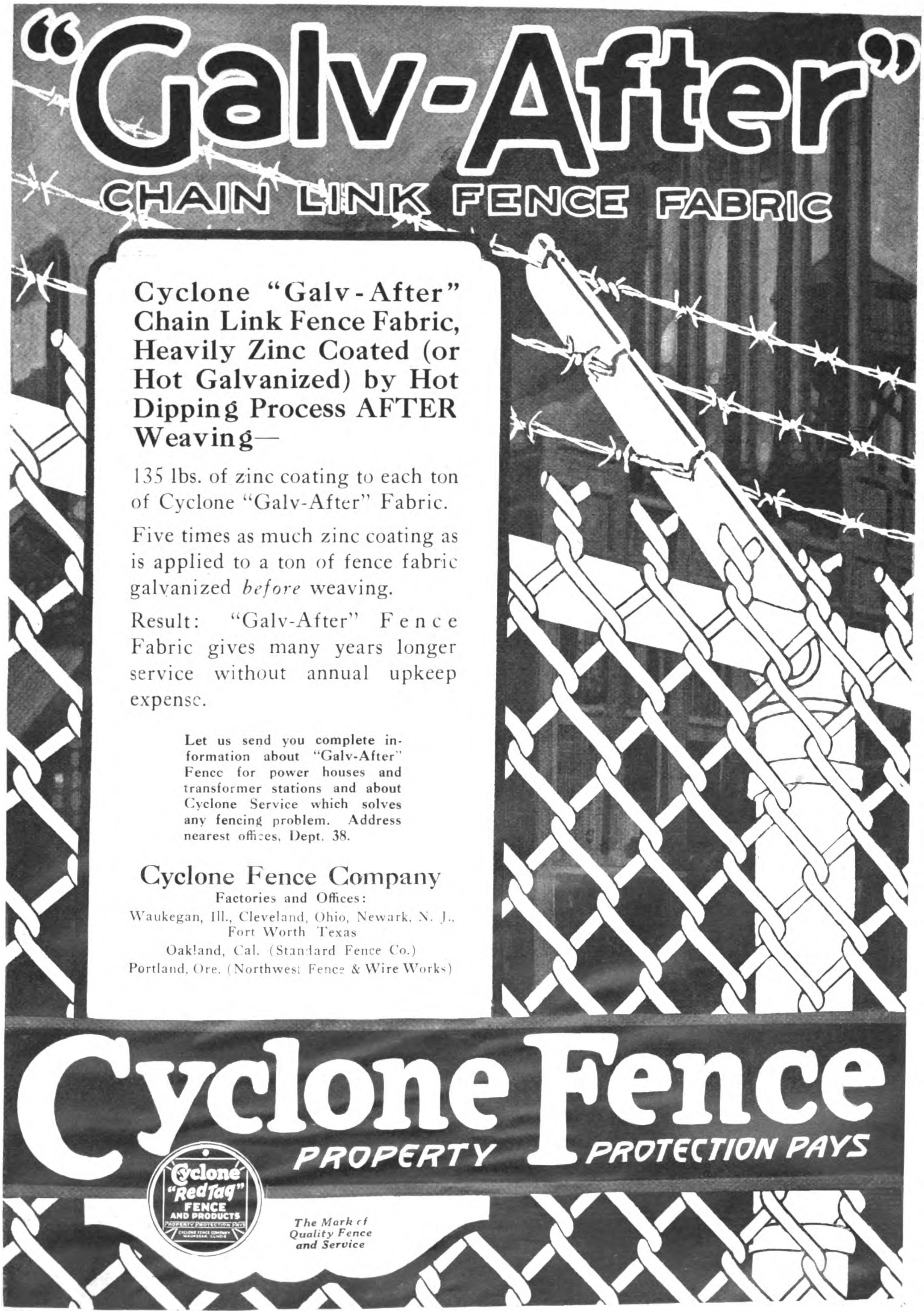
Full details on request. Let us quote you.



Bemis Car Truck Company
Electric Railway Supplies
Springfield, Mass.

REPRESENTATIVES:

Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Oregon
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.



"Galv-After"

CHAIN LINK FENCE FABRIC

Cyclone "Galv-After" Chain Link Fence Fabric, Heavily Zinc Coated (or Hot Galvanized) by Hot Dipping Process AFTER Weaving—

135 lbs. of zinc coating to each ton of Cyclone "Galv-After" Fabric.

Five times as much zinc coating as is applied to a ton of fence fabric galvanized *before* weaving.

Result: "Galv-After" Fence Fabric gives many years longer service without annual upkeep expense.

Let us send you complete information about "Galv-After" Fence for power houses and transformer stations and about Cyclone Service which solves any fencing problem. Address nearest offices, Dept. 38.

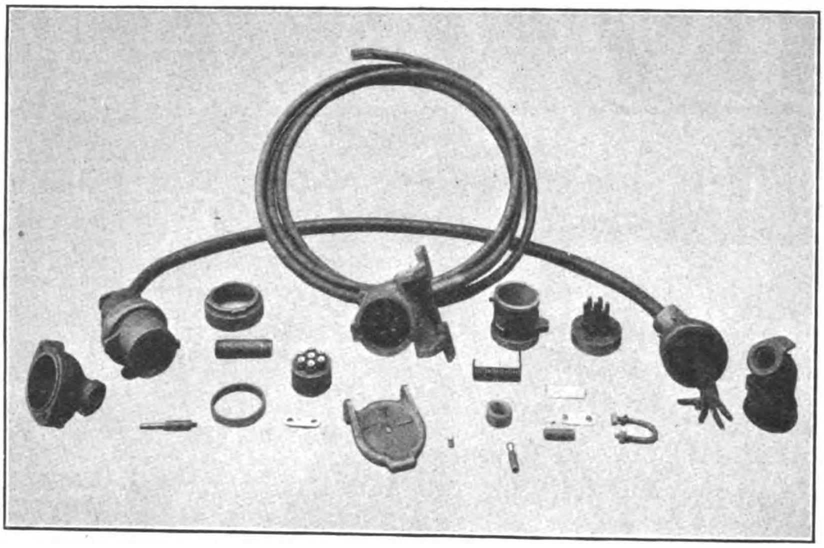
Cyclone Fence Company
Factories and Offices:
Waukegan, Ill., Cleveland, Ohio, Newark, N. J., Fort Worth Texas
Oakland, Cal. (Standard Fence Co.)
Portland, Ore. (Northwest Fence & Wire Works)

Cyclone Fence

PROPERTY PROTECTION PAYS

Cyclone
"Red Tag"
FENCE
AND PRODUCTS
PROPERTY PROTECTION PAYS
CYCLONE FENCE COMPANY
WAUKEGAN, ILLINOIS

The Mark of Quality Fence and Service



COLUMBIA JUMPERS AND SOCKETS

Columbia Jumpers and Sockets are manufactured from highest grade materials to meet the demands of the severe service placed upon them.

The assembling in our shops is carried on by mechanics highly proficient in this special line of work.

We are completely equipped to manufacture all kinds and types of train line, door control and conductor cable Jumpers and Sockets.

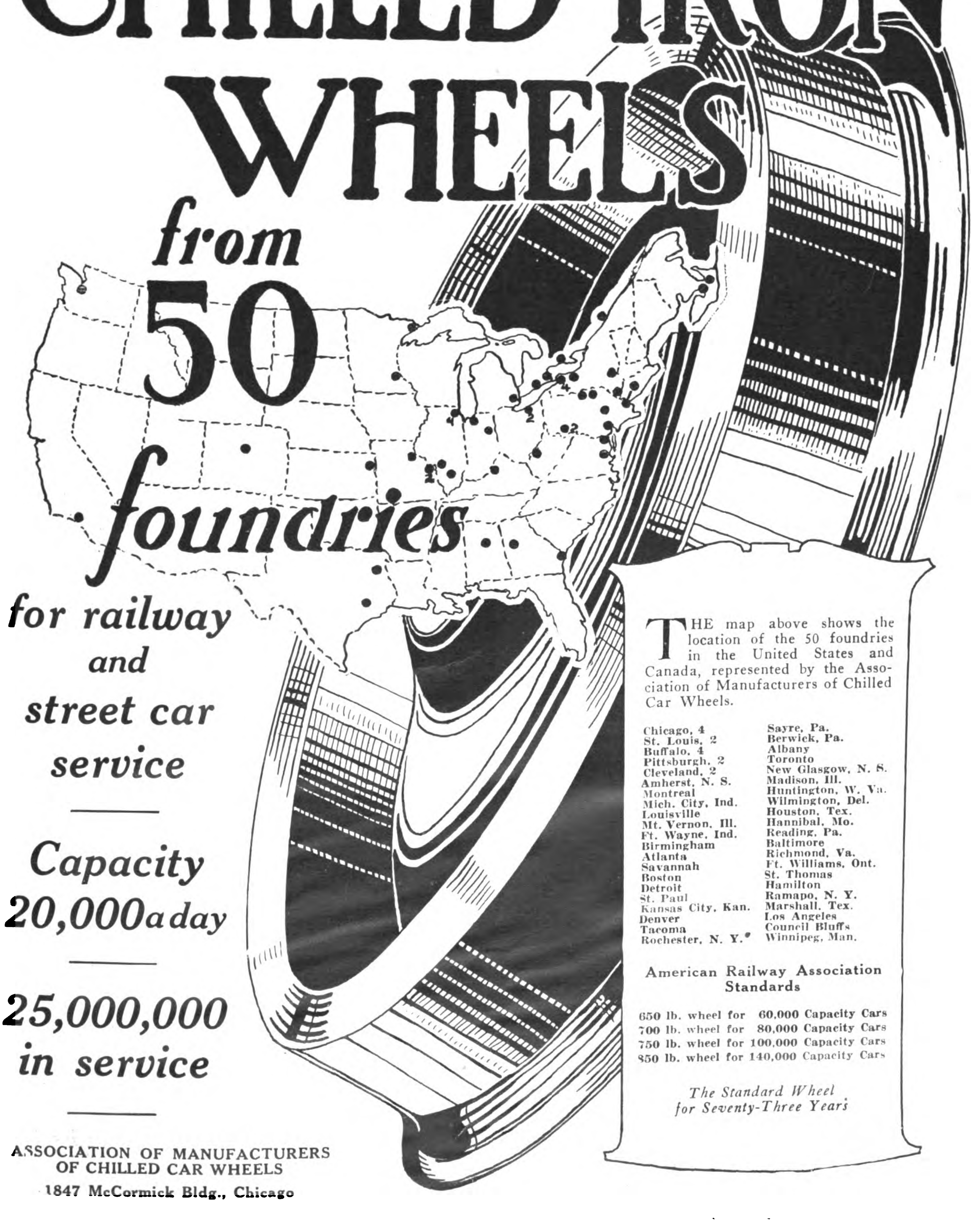
May we figure with you?

COLUMBIA MACHINE WORKS

3313 ATLANTIC AVE., BROOKLYN N. Y.

CHILLED IRON WHEELS

from 50 foundries



for railway and street car service

Capacity 20,000 a day

25,000,000 in service

ASSOCIATION OF MANUFACTURERS
OF CHILLED CAR WHEELS
1847 McCormick Bldg., Chicago

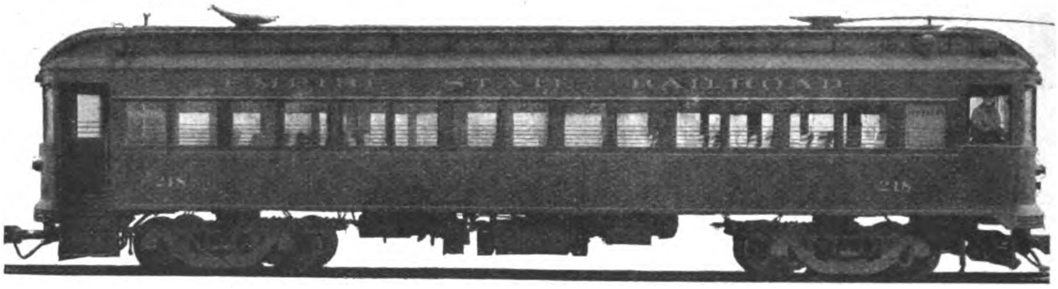
THE map above shows the location of the 50 foundries in the United States and Canada, represented by the Association of Manufacturers of Chilled Car Wheels.

Chicago, 4
St. Louis, 2
Buffalo, 4
Pittsburgh, 2
Cleveland, 2
Amherst, N. S.
Montreal
Mich. City, Ind.
Louisville
Mt. Vernon, Ill.
Ft. Wayne, Ind.
Birmingham
Atlanta
Savannah
Boston
Detroit
St. Paul
Kansas City, Kan.
Denver
Tacoma
Rochester, N. Y.
Sayre, Pa.
Berwick, Pa.
Albany
Toronto
New Glasgow, N. S.
Madison, Ill.
Huntington, W. Va.
Wilmington, Del.
Houston, Tex.
Hannibal, Mo.
Reading, Pa.
Baltimore
Richmond, Va.
Ft. Williams, Ont.
St. Thomas
Hamilton
Ramapo, N. Y.
Marshall, Tex.
Los Angeles
Council Bluffs
Winnipeg, Man.

American Railway Association Standards

650 lb. wheel for 60,000 Capacity Cars
700 lb. wheel for 80,000 Capacity Cars
750 lb. wheel for 100,000 Capacity Cars
850 lb. wheel for 140,000 Capacity Cars

The Standard Wheel for Seventy-Three Years



Equipped with our

ROLLED STEEL WHEELS AND AXLES

ISI

"Not only to make better products but to make them better understood—not only to sell but to serve, assisting those who buy to choose as well as use their purchases—this is the privilege if not the practice of all modern manufacturers."—Vauclain.

STANDARD STEEL WORKS COMPANY
PHILADELPHIA, PA.
BRANCH OFFICES
CHICAGO
ST. LOUIS
NEW YORK
HOUSTON, TEXAS
PORTLAND, ORE.
RICHMOND, VA.
SAN FRANCISCO
BOSTON
ST. PAUL, MINN.
PITTSBURGH, PA.
LOS ANGELES, CAL.
MEXICO CITY, MEX.
WORKS: BURNHAM, PA.

ERICO RAIL BONDS

Type ET

Type AT-F

Brazed Bonds

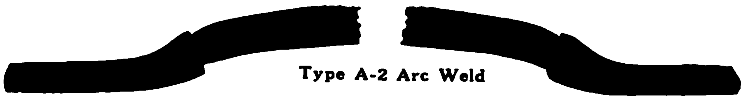
Have the most conductivity of all rail bonds. For this reason they are unexcelled for bonding long track sections where feeders are infrequent, or track sections where the return current load is particularly heavy.

Standard Brazed Bond types are available for bonding the head of rail; or the web of rail, either concealed or exposed. Brazed bonds can be made in any capacity, length and shape of loop desired.

Arc Weld Bonds

Can be applied with the very portable equipment and the services of a single operator. While not so conductive as the Brazed bond, they can be very cheaply installed at infrequent intervals along the track for replacements, and in places in special work where access is difficult.

Types for application to head and top of base of rail. Capacities 2/0, 4/0 and 400,000 CM are standard.

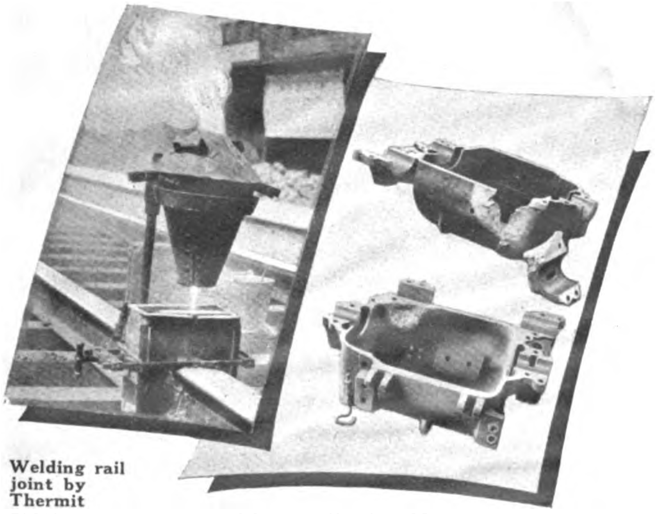


Type A-2 Arc Weld

The Electric Railway Improvement Co.

Cleveland, Ohio

THERMIT WELDS



Welding rail joint by Thermit process.

Thermit Welded Motor case before and after welding.

IN

The Way Department

Thermit Welds eliminate joints and rail bonds. Reduces car depreciation. Saves paving expense around joints because of prolonged life of track. Eliminates electrolysis. Frogs and Crossings can be shop made.

The Shop

A Thermit Welding Outfit will save many dollars in repairing truck frames—broken motor cases and other uses too numerous to mention.

Our expert operators will teach your own men both in track and shop work, and show them the most efficient methods of making Thermit Welds.

Metal & Thermit Corporation, 120 Broadway, N. Y.

PITTSBURGH CHICAGO BOSTON S. SAN FRANCISCO TORONTO

TRADE ANDERSON MARK

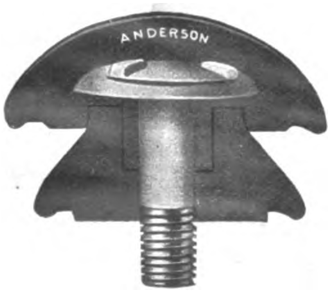
Cap and Cone Suspensions

The malleable iron casting, which takes the strain, spreads out and protects the insulation from trolley blows and also acts as a watershed.

Fins on the head of the steel stud prevent it from turning when tool is used for tightening. The head is larger than the hole in the Suspension Casting, which prevents the wire from falling in the event of injury to the insulation.

Anderson Cap and Cone Suspensions are made for Straight Line, Single and Double Curve, Barn, Strain, Rigid and Hinged Bracket Arm.

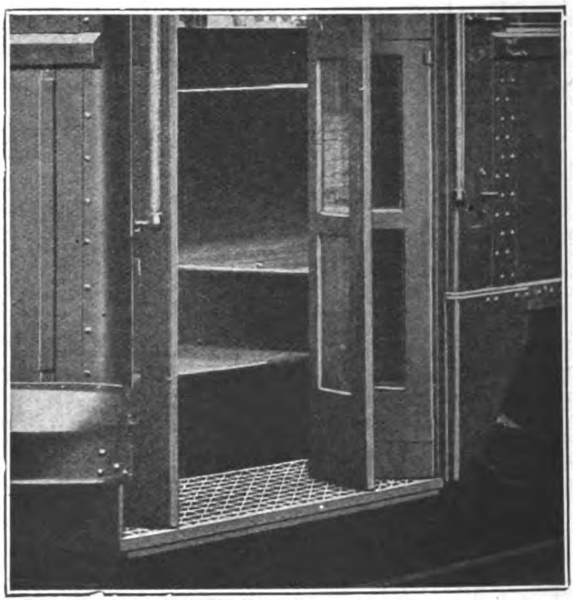
We will be glad to quote you on your next Cap and Cone requirements.



Albert & J. M. Anderson Mfg. Co.
289-305 A St., Boston, Mass.

Branches:
New York, 135 Broadway
Philadelphia, Broad and Chestnut Sts.
Chicago, 105 So. Dearborn St.
London, 12 Moor Lane, E. C. 2.

IRVING SUBWAY TRADE MARK (PATENTED) THE FIREPROOF VENTILATING FLOORING



IRVING SAFKAR STEP TRADE MARK
ALL-STEEL AND PERMANENTLY NON-SLIPPING

There's built-in accident insurance in every one of these all-steel, non-slipping safety car steps. Their surface—narrow edge-on steel strips closely spaced—grips the foot unfailingly, even with water or snow or oil or grease upon it. They're cleanly steps, too — dirt falls through them. And as to their economy — well, they'll probably outlast any car they're put on. There's a size for every purpose. Ask for Catalog 4A-28.

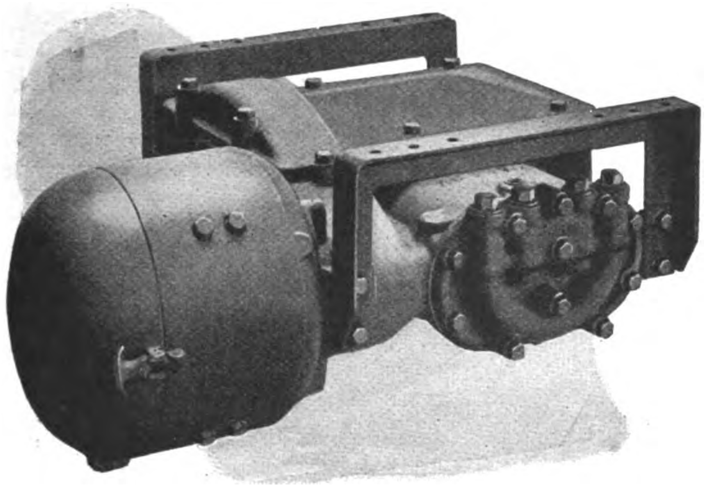
IRVING IRON WORKS CO.
LONG ISLAND CITY, N.Y., U.S.A.

MANUFACTURERS OF

IRVING SUBWAY TRADE MARK
(PATENTED) REG. U.S. PAT. OFF.
THE FIREPROOF VENTILATING FLOORING

ALLIS-CHALMERS

AA-7B Air Compressor



Compressor for Street Car Mounting

A single acting duplex compressor with crank case and cylinders integral. One-piece cylinder head for both cylinders contains suction and discharge valves. Trunk pistons operated by connecting rods with bushings provided for taking up wear.

Heavily designed crankshaft of high-grade steel turns in journal bearings of ample proportions to insure minimum wear.

Herringbone Gears transmit power from motor shaft to crankshaft with practically silent operation.

Lubrication is positive and efficient. Connecting rods dip into the oil and splash reaches all working parts. Gears run in oil.

Send for Bulletin

ALLIS-CHALMERS MANUFACTURING CO.
MILWAUKEE, WIS. U.S.A.

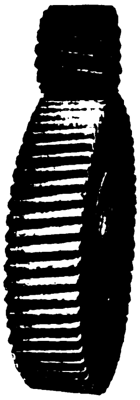
Our H. B. Life Guard

Has Met the Test and Made Good!

Get the H. B. Guard with a real record of efficiency by writing this definite wording in your specifications—

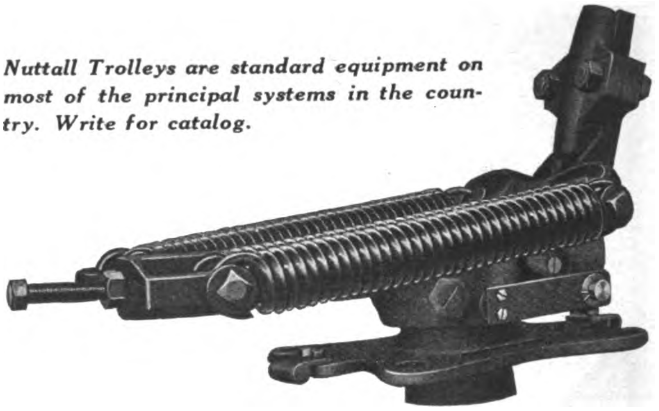
**"H. B. Life Guards
To Be Manufactured By
The Consolidated Car Fender Company"**

WENDELL & MAC DUFFIE COMPANY
General Sales Agents
110 East 42nd St., New York, N. Y.



Nuttall Helical
Gear Set

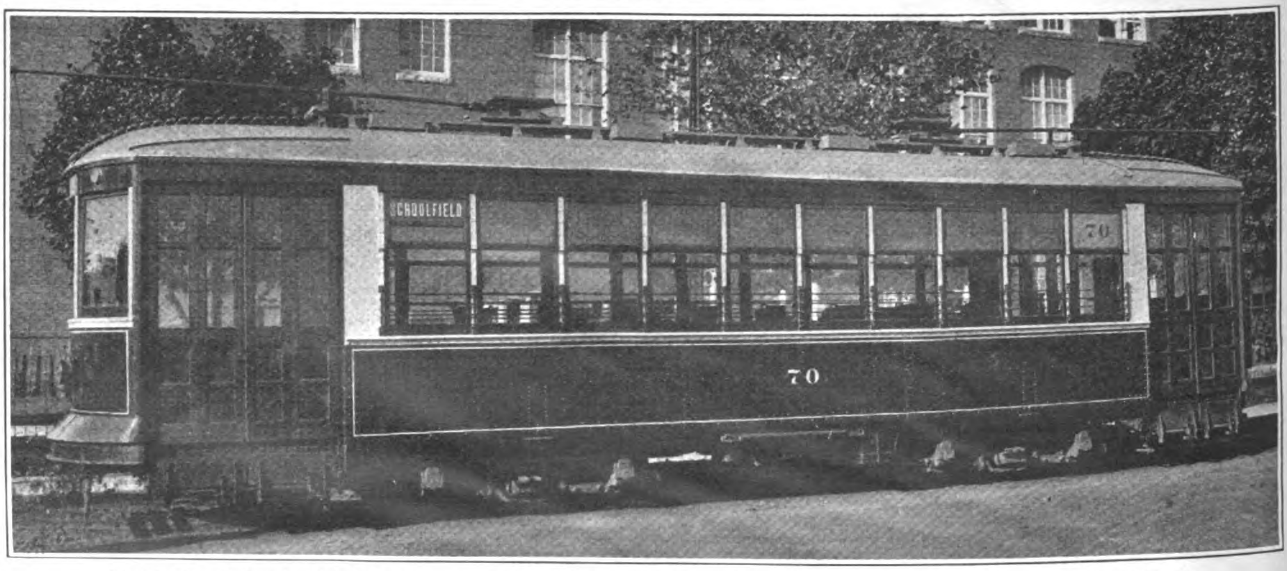
Are you obtaining maximum efficiency and minimum maintenance cost from your gears? Nuttall Helical Gears insure both.



Nuttall Trolleys are standard equipment on most of the principal systems in the country. Write for catalog.

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.



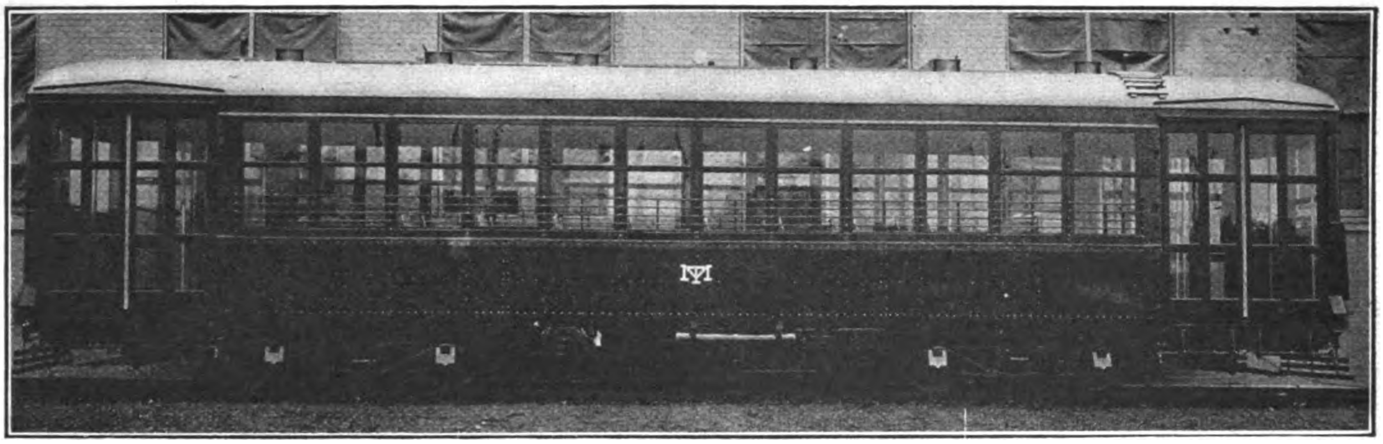
Double Truck Safety Car for one-man or two-man operation. Built for Danville Traction & Power Co., Danville, Va.

Built by the
PERLEY A. THOMAS
CAR WORKS
High Point, N. C.

This car is one of the most recent samples of Perley A. Thomas car construction. Our cars are built to satisfy. In appearance, in operation, in durability and in low maintenance, "Thomas-built" cars are satisfactory cars.

Whatever your requirements may be—safety cars, larger city cars, or interurbans—we can offer early delivery at most attractive prices.

Let us quote on your 1924 order!



More and more companies want—

UNIVERSAL SAFETY CARS

Its high capacity (54 seats)—light weight (15 tons)—and one- or two-man operating arrangements have made it the outstanding recent advance in electric railway car design. Instant popularity has been its achievement. Can you use such a car?

Write for specifications

Of course they are "QUALITY" CARS

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"

You're having brush trouble

CORRECT IT
USE LE CARBONE CARBON BRUSHES

They talk for themselves

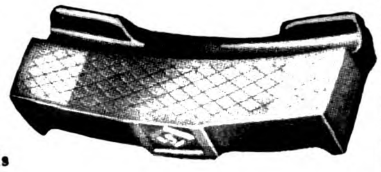
COST MORE PER BRUSH
COST LESS PER CAR MILE

W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto

Brake Shoes
A.E.R.A. Standards

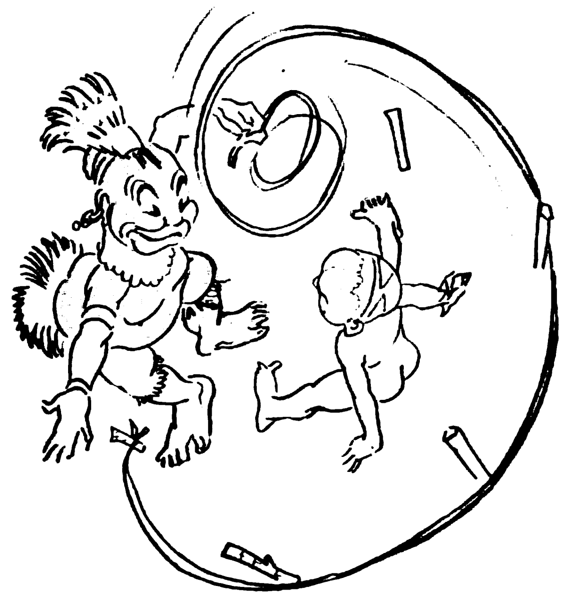
Diamond "S" Steel Back is the Best Type

Standard Patterns for SAFETY CAR



D-67 for Narrow Treads
D-87 for Wide Treads

American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.



Intambo

Intambo is to the Kaffir what geometry is to the engineer.

It is a thong rope made of oxhide which describes the circle on which a hut is built.

This first principle in construction is always taught the boy before he becomes a man—so that when he establishes his own domicile he is equipped to build his hut.

Getting down to first principles is good business—especially in brush buying.

You simply cannot rush in from the sidelines and know brushes.

So in Morganite selling—brush engineers are available to co-operate with you in getting good commutation through engineering prescription.

You can't learn this too young, so lose no time in getting in touch with the address below that is nearest to you.

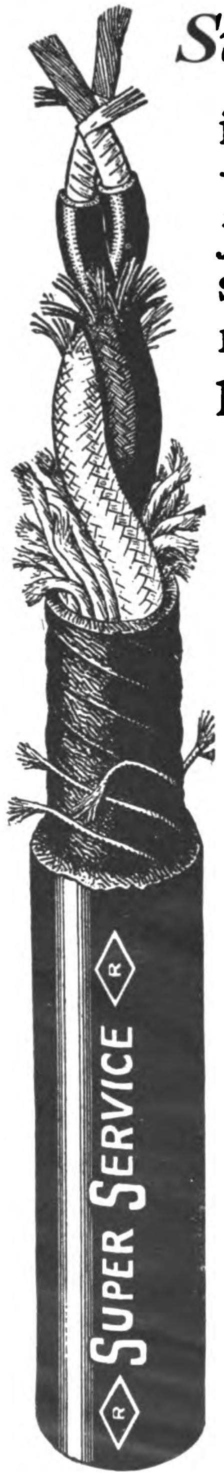
Morganite Brush Co., Inc.

Main Office and Factory:
519 West 38th St., New York

DISTRICT ENGINEERS AND AGENTS

Pittsburgh, Electrical Engineering & Mfg. Co., 909 Penn Ave.
Cincinnati, Electrical Engineering & Mfg. Co., 607 Mercantile Library Building.
Cleveland, Electrical Engineering & Mfg. Co., 422 Union Building.
Buffalo, Electrical Engineering & Mfg. Co., 409 Lafayette Building.
Philadelphia, Electric Power Equipment Corp., 412 North 18th St.
Baltimore, O. T. Hall, Sales Engineer, 1926 Edmondson Ave.
Revere, Mass., J. F. Drummey, 75 Pleasant Street.
Los Angeles, Special Service Sales Co., 502 Delta Building.
San Francisco, Special Service Sales Co., 202 Russ Building.
Toronto, Can., Railway & Power Engineering Corp., Ltd., 131 Eastern Ave.

ROME WIRE



Super Service

is the name of the product just as super service is the nature of its performance

Rome Super Service Cord and Cable is different in construction just as it is different in the service it gives. We want to send you the big poster showing in detail exactly how it's made. It will help you sell Super Service Cord and Cable. Drop us a postal for your copy today!

ROME WIRE COMPANY
Executive Office and Mills:
ROME, N. Y.
Diamond Mills: Buffalo, N. Y.
Atlantic Mills: Stamford, Conn.

District Sales Offices:

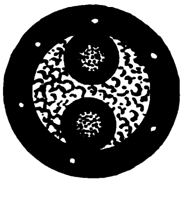
NEW YORK
50 Church St.

CHICAGO
14 E. Jackson Blvd.

DETROIT
25 Parsons St.

LOS ANGELES
J. G. Pomeroy
336 Azusa St.

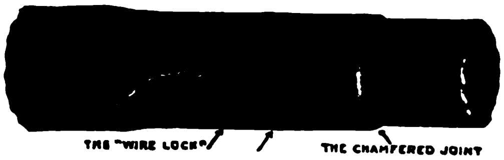
BOSTON
Little Building



WIRE-ROME

2125-L

ELRECO TUBULAR POLES



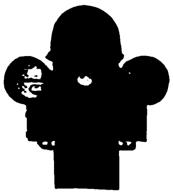
COMBINE
Lowest Cost Lightest Weight
Least Maintenance Greatest Adaptability
Catalog complete with engineering data sent on request
ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
NewYork City, 30 Church Street

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE
AMERICAN ELECTRICAL WORKS — AMELECTRIC — Wires and Cables — PHILLIPSDALE, R.I.
Reg. U. S. Pat. Office
Incandescent Lamp Cord
AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

Shaw Lightning Arresters
Standard in the Electric Industries for 35 years
Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

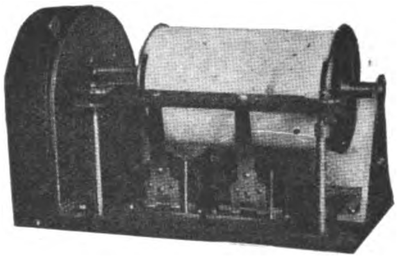
Chapman
Automatic Signals
Charles N. Wood Co., Boston

ANACONDA
TROLLEY WIRE
ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.
THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.



U. S. ELECTRIC
AUTOMATIC SIGNAL
for single track block signal protection
United States Electric Signal Co.
West Newton, Mass.

The Engineer Speaks:



Nachod Headway Recorders are certainly a big step towards higher efficiency in the operation of Electric Railways. Against the competition of both jitney and private automobiles, the real deterrent is *fast service* with cars the railway company can afford to run on *short headway*.

Exact Operation to Time Points

will help greatly—a feature that can be made effective automatically by the use of Nachod Headway Recorders. Write for Recorder Manual. Nachod Signal Co., Inc., Lousiville, Ky., Manufacturers of Block Signals and Highway Crossing Signals.

Nachod Headway Recorders

Lapp Insulators
Lapp Insulator Co. Inc. LeRoy, N.Y.
Trade Mark

Standard Underground Cable Co.
Manufacturers of
Electric Wires and Cables of all kinds;
also Cable Terminals, Junction Boxes, etc.
Boston Philadelphia Pittsburgh Detroit New York
San Francisco Chicago Washington St. Louis

ROEBLING

WELDING CABLE
ELECTRICAL WIRES and CABLES
John A. Roebling's Sons Company, Trenton, N. J.

RAMAPO AJAX CORPORATION
Ramapo Automatic Return Switch Stands for Passing Sidings
RACOR TRADE MARK
RACOR Tee Rail Special Work.
Manganese Construction
GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

American
Rail Bonds

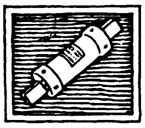
CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

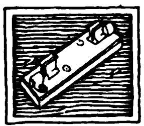
Arc Weld and Flame Weld

Send for new
Rail Bond Book

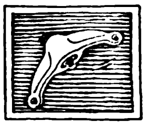
American Steel & Wire
CHICAGO
NEW YORK
Company

J-P Products of interest to Electric Railways

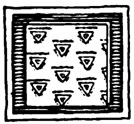

NOARK *Fuses*


NOARK *Fuse Clips*
CUTOUT BASES

NOARK *Service and Underground Boxes*


Railway and Mine hangers and insulators

J-P Molding Service [Contract Basis]


VULCABESTON
Sheet and Rope Packing

JOHNS-PRATT CO. HARTFORD, CONN.

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE
CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

DUNDEE "A" AND "B" FRICTION TAPES

DUNDEE
A
FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

are
Okonite
Products

'Nuff Said!

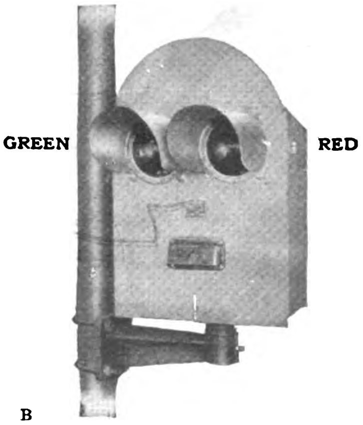
DUNDEE
B
FRICTION TAPE
THE OKONITE COMPANY
PASSAIC, N.J.
U.S.A.

Write for Samples and Circulars

THE OKONITE CO., Passaic, N. J.
Incorporated 1884

Sales Offices: New York—Atlanta—Pittsburgh—San Francisco
Agents: Central Electric Co., Chicago, Ill.; Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.

OKONITE
TRADE MARK
REG. U.S. PAT. OFFICE



SEND
TODAY
for our new Publication on
SAFETY
and
EFFICIENCY
in Electric Railway
Signals and
Crossing Bells

American Insulating
Machinery Co., Inc.
521 Huntingdon Street
Philadelphia, Pa.

GODWIN STEEL
PAVING GUARDS

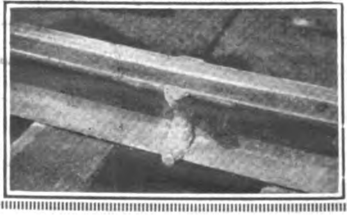
Adapted to all types of rails and paving.

W. S. GODWIN CO., Inc.

Proven by service to economically prevent seepage and disintegration of street railway paving.

Write for Illustrated Catalog No. 20.

Race & McComas Sts.,
Baltimore, Md.



FERALITE
ALUMINO-THERMIC WELDING SUPPLY

ALUMINO-THERMIC
JOINTS

New and independent process. No inserts needed. Up-to-date and economical.

Alumino-Thermic Corp.,
Roselle Park, N. J.

METAL SAFETY CROSS TIES

Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.

REVOLUTIONIZES ROADBEDS

Write for descriptive folder and quotation.

METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

HUBBARD POLE BAND

With Pull-Off Rod

This Band eliminates the use of several bands on a pole as any number of guys may be secured to the rod.

HUBBARD & COMPANY
PITTSBURGH CHICAGO

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU. H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

THE BABCOCK & WILCOX COMPANY
STEAM

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

Progressive Inspection of Electric Railway Equipment
is the name of a descriptive bulletin we are sending electric railway executives interested in better, more durable cars for their lines. If you have not received your copy—write today.

PITTSBURGH TESTING LABORATORY
Inspection Engineers and Chemists
PITTSBURGH, PENNA.
Branch Offices in the Principal Cities

P

Lorain Special Trackwork Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.
Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

Awebco
WOONSOCKET PLANT - ANCHOR WEBBING COMPANY - PAWTUCKET PLANT

Use only Awebco Tape on your Armatures
Field Coils have better protection when wound with "AWEBCO Tape." Send for samples.

ANCHOR WEBBING COMPANY
300 Brook Street, Pawtucket, Rhode Island

A Single Segment or a Complete Commutator
is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

Cameron Electrical Mfg. Co., Ansonia, Connecticut

BUCKEYE JACKS
high-grade R. R. Track and Car Jacks
The Buckeye Jack Mfg. Co.
Alliance, Ohio

The Most Successful Men in the Electric Railway Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

OXYGEN
FOR CUTTING, WELDING, ETC.
INTERNATIONAL OXYGEN COMPANY
NEWARK NEW YORK PITTSBURGH TOLEDO

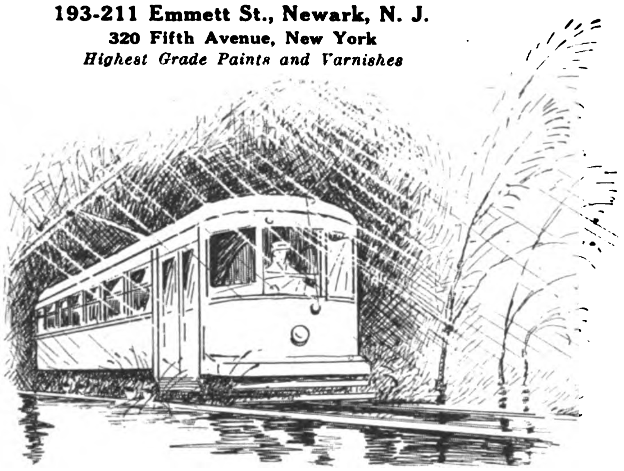
BLUE RIBBON
Pale
Railway Durable
Body Finishing Varnish

The highest grade varnish made for finishing coats on electric railway equipment.

It seems to wear forever and always looks bright. Others use it; why don't you?

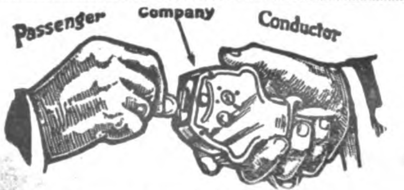
Write us for a sample.

The Beckwith-Chandler Co.
193-211 Emmett St., Newark, N. J.
320 Fifth Avenue, New York
Highest Grade Paints and Varnishes



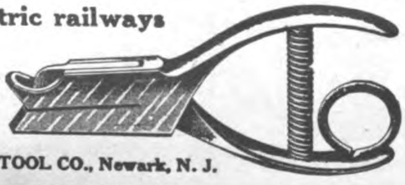
THE WORLD'S STANDARD
"IRVINGTON"
Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities



Direct
Automatic
Registration
By the
Passengers
Rooke Automatic
Register Co.
Providence, R. I.

75% of the electric railways
use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.



PERFECT
MICANITE
INSULATOR
Reg. U. S. Pat. Off.

ELECTRICAL INSULATION

Micanite armature and commutator insulation, commutator segments and rings, plate, tubes, etc., Empire oiled insulating materials; Linotape; Kablak; Mico; and other products—for the electrical insulating requirements of the railway.

Catalogs will gladly be furnished

MICA INSULATOR COMPANY
Sole Manufacturers of Micanite
Established 1893
68 Church St., New York 542 So. Dearborn St., Chicago
Works: Schenectady, N. Y.
8-F

Standard of
Quality
REG. U.S. PAT. OFF. TRADE HOPE MARK MADE IN U.S.A.

Quality is the total of good materials and careful manufacture.

That is why, for 40 years, manufacturers of electrical apparatus have found HOPE tapes to be the Standard of Quality.

Let us send you the HOPE Sample Booklet

Electric Tape

HOPE
HOPE
HOPE
HOPE
HOPE
HOPE

HOPE WEBBING COMPANY, INC.
PROVIDENCE, RHODE ISLAND
New York Troy Chicago

PS HEATERS

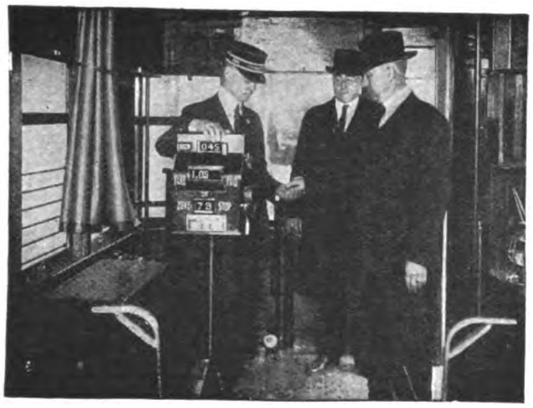
Car Heating and Ventilation

are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

Heywood-Wakefield
CAR SEATS
of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.
HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York, Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition



OHMER
FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

Fare Registration on a Modern Basis

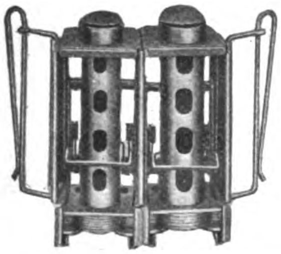
193
IN
THE INTERNATIONAL REGISTER CO.
CHICAGO
10224

Simple and accurate as the International method has always been the modern tendency in street railway practice toward automatic operation is reflected in the newest type registers, equipped with electric Backs, removing the last drag on the platform worker, and contributing to the quicker handling of traffic.

Registers made in various types to meet the requirements of service on Electric Railways.
Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

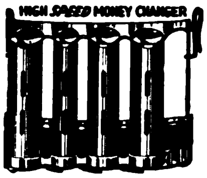
Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

HIGH SPEED MONEY CHANGERS

1924 model —without rivets— ready for delivery



Supplied in one or four tube Combinations

Essential wherever the rapid and accurate handling of change is required. Now included in the standard equipment of largest Traction Companies because conductors demand them.

Prices and Literature sent on request

J. L. GALEF, 75 Chambers St., N. Y. C.
Exclusive Manufacturer's Selling Agent

"OSKELITE"

The Stop Light for street cars. Operates from brake system. Details on request.

The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.

Coin Counting and Sorting Machines
FARE BOXES
Lever-Operated and Slip Change Carriers
The Cleveland Fare Box Co.
Cleveland, Ohio
Canadian Cleveland Fare Box Co., Ltd., Preston, Ont.

RAILWAY UTILITY COMPANY

Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings:
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for
Catalogue

1328 Broadway
New York, N. Y.

ELECTRIC CAR HEATERS
THERMOSTATS BUZZERS
PNEUMATIC DOOR OPERATORS
CONSOLIDATED CAR-HEATING CO.
NEW YORK
ALBANY, N.Y.
CHICAGO

"TAYLOR-MADE" TRUCKS

Have proven their SUPERIORITY for over 30 YEARS, for all types of electric railway cars.
Taylor R. H. Double Truck especially designed for PETER WITT Type Cars.

TAYLOR STRAIGHT ACTION BRAKES

Have made a record for
Safety, Low Maintenance Cost and Successful Brake Operation
In the specifications for your new cars include
"Taylor-Made" Trucks Equipped with Taylor Straight Action Brakes

TAYLOR ELECTRIC TRUCK CO., TROY, N. Y.
ESTABLISHED 1892.

W.T.B.S. PAT MAY 21 98 SEPT 1 03 DEC 29 08 AUG 2 04 JUNE 15 09

Defective Wheels Corrected While They Run

WHEEL TRUING BRAKE SHOES

—keep your cars and wheels in service. Abrasive blocks in various sections correct flattening or wear on any part of flange or tread. Write for booklet.

Wheel Truing Brake Shoe Co.
Detroit, Mich.

Trade Mark—Wheel Truing Brake Shoe

TULC
A
LUBRICANT

We make a specialty of

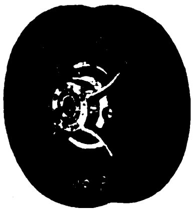
ELECTRIC RAILWAY LUBRICATION

We solicit a test of TULC
on your equipment

The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

The Kalamazoo Trolley Wheels

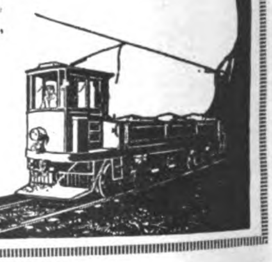
have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

The Differential Car

An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.



The Differential Steel Car Co.
Findlay, Ohio

B. A. HEGEMAN, Jr., President C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.

Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

- Tool Steel Gears and Pinions
- Pittsburgh Forge & Iron Company's Products
- Anglo-American Varnish Co., Varnishes, Enamels, Etc.
- National Hand Holds
- Drew Line Material and Railway Specialties
- Genesco Paint Oils
- Turnstile Car Corporation—Turnstiles
- Dunham Hopper Door Device
- Anderson Slack Adjusters
- Economy Electric Devices Co., Power Saving and Inspection Meters
- Ft. Pitt Spring & Mfg. Co. Springs
- C.-H. Electric Heaters
- Garland Ventilators
- E-Z Car Control Safety Devices
- Lind Aluminum Field Coils
- Flaxlinum Insulation
- Yellow Coach Mfg. Co., Buses

V-K

OILLESS TROLLEY WHEEL and NON ARCING HARP

"PERFECT LUBRICATION PLUS MAXIMUM CONDUCTIVITY"

More-Jones Brass & Metal Co
ST. LOUIS MISSOURI

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches	$4.50 an inch
4 to 7 inches	4.30 an inch
8 to 14 inches	4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E.F J.

POSITIONS VACANT

A GENERAL track foreman wanted; to have charge of four or five gangs on construction and general track maintenance work in Connecticut. State qualifications and give references. P-671, Electric Railway Journal, 10th Ave. at 36th St., New York.

GENERAL shop foreman wanted for Middle West property, experienced in heavy traction equipment as well as city. In application, state qualifications, references and salary expected. P-678, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

SUPERINTENDENT for high-speed interurban line, consisting of 107 miles in central territory. One who has had experience covering the installation and operation of light weight, one man operated interurban cars, preferred. P-674. Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

AS M. M. or with chance for advancement. Experienced low and high voltage DC. equipment, passenger and freight, city and interurban. Expert on motor and controller repairs. PW-672, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

AUDITOR, with thorough experience large railway, electric and gas properties, seeks engagement. PW-677, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

CIVIL engineering draftsman seeks opening in drawing office or field with street railway company or manufacturer. PW-679, Electric Railway Journal, Real Estate Trust Bldg., Philadelphia, Pa.

GRADUATE civil engineer desires permanent position, experienced in construction and design of subway and street railway tracks, valuation, rehabilitation, maintenance, welding, pavements and executive and contractors engineer. PW-675, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT of city and interurban road operating fifty cars, seeks similar position affording greater opportunity for advancement. Successful in maintenance, operation and public relations. Age 35; salary $3,600. PW-673, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

WANTED to locate with city or interurban railway in equipment, distribution, purchasing, construction, traffic and transportation or other capacity requiring engineering ability. Over ten years' experience in railway and power manufacturing, installation, operating. Your proposition solicited. PW-651, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

WANTED

Truck Cars and Bodies

2—Standard Single Truck Cars, complete, and 2 bodies only.

PARIS TRANSIT CO., Paris, Texas.

CARS

3—Double end, closed cars, seating 32, Sheffield-Baldwin, with Allis-Chalmers, 301 motors, 32 ft. long, 4-ft., 8½-in. gauge, each....$1200

2—Open Trailers, 4-ft., 8½-in. gage; St. Louis Car Co., 21 ft., 6 in. long, each.......$350

ZELNICKER IN ST. LOUIS

Rail, Piling, Compressors, Generators, Etc.

Rails!

When you need new or relaying rails, come to headquarters and get just what you want, in any quantity, and get them quick.

We always have a big stock of rails, from 12 lbs. to 100 lbs. per yard, for immediate delivery. Every rail inspected and guaranteed. Complete with the necessary angle bars.

When it comes to price we are also headquarters—we have complete stocks of new and relaying rails of all weights available for prompt shipment located in thirty convenient distributing points throughout the United States, Canada and Cuba—which in turn means we can make immediate shipments at unbeatable prices to our customers. "Tons of Rails Right at Your Door." Write, 'phone or wire us your requirements.

HYMAN-MICHAELS COMPANY

"The House of Dependable Service"

122 South Michigan Avenue, Chicago

Dealers in New and Relaying Rails, Locomotives and Railway Equipment

District Offices: New York, Woolworth Bldg.; St. Louis, Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.; Detroit, Book Bldg.; San Francisco, 234 Steuart St.

Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa., San Francisco. *Cable Address:* "Hymanmikel"

World's Largest Distributors of Rails

FOR SALE

20—WH B-2 20-ft.

Air Compressors

Overhauled.

TRANSIT EQUIPMENT COMPANY,
501 Fifth Avenue, New York

RAILS WANTED

235 tons, 6-in. High T or Shanghai.
72 lb. to 95 lb. per yd.
State Price, Condition, Location.

W-669, Electric Railway Journal
1570 Old Colony Bldg., Chicago, Ill.

FOR SALE

Electric Locomotive

Standard G. E. 50-ton Locomotive in first-class condition. Locomotive may be seen in daily operation.

ALBANY SOUTHERN R. R. CO.,
Rensselaer, N. Y.

FOR SALE

Deck Plate Girder Bridge

built for electric railway by American Bridge Co. 61 ft. long, 20 tons weight.

For particulars address

York Utilities Company

Kennebunk, Maine.

FOR SALE

50—G. E. No. 80-A Motors.
50—Controllers, K-28-B; K-12.
35—B-2 Compressors.

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with
Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Receivers, Aftercoolers
Ingersoll-Rand Co.

Amusement Park Equipment
Walker Amusement Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse Elec. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stand
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Johnson & Co., J. R.
St. Louis Car Co.
Standard Steel Works Co.

Axles, Bus
Standard Steel Co.

Axle Straighteners
Columbia M. W. & M. I. Co.

Axles, Car Wheel
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
Taylor Electric Truck Co.
Westinghouse Elec. & M. Co.

Babbitting Devices
Columbia M. W. & M. I. Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co., The

Batteries, Dry
Nichols-Lintern Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
General Electric Co.
A. Gilbert & Sons, B. F. Co.
More-Jones Brass & Metal Co.
Taylor Electric Truck Co.
Westinghouse Elec. & M. Co.

Bearings, Center and Roller Side
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car Heating Co.
Elec. Service Supplies Co.

Benders, Rail
Railway Track-work Co.

Boiler Tubes
Nat'l Tube Co.

Boilers
Babcock & Wilcox Co., The

Bond Testers
Amer. Steel & Wire Co.
Elec. Service Supplies Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Indianapolis Switch & Frog Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
Westinghouse Elec. & M. Co.

Book Publishers
McGraw-Hill Book Co., Inc.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts etc.)
American Bridge Co.
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Nat'l Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Brake Shoe & Fdry. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Taylor Electric Truck Co.
Wheel Truing Brake Shoe Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
Taylor Electric Truck Co.
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Morganite Brush Co.
Westinghouse Elec. & M. Co.

Brushes Graphite
Morganite Brush Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Bunkers, Coal
American Bridge Co.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.

Cables (See Wires and Cables)

Calculating Machines
W. A. Morschhauser

Cambric Tapes, Yellow & Black Varnish
Irvington Varnish & Ins. Co.

Cambric Yellow & Black Varnish
Mica Insulataor Co.

Carbon Brushes (See Brushes, Carbon)

Car Lighting Apparatus
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heating Co.
Westinghouse Elec. & M. Co.

Car Steps Safety
Irving Iron Works

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Differential Steel Car Co., Inc.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Cars, Gas Rail
St. Louis Car Co.

Cars, Passenger, Freight Express, etc.
American Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Thomas Car Wks., Perley A.
Wason Mfg. Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

Cars, Self-Propelled
General Electric Co.

Castings, Brass, Composition or Copper
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
More-Jones Brass & Metal Co.

Castings, Funnel
Wharton, Jr. & Co., Inc., Wm.

Castings, Gray Iron and Steel
American Bridge Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Standard Steel Works
Wharton, Jr., & Co., Inc., Wm.

Castings, Malleable and Brass
Amer. Brake Shoe & Fdry. Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.

Catchers and Retrievers, Trolley
Earll, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Change Carriers
Cleveland Fare Box Co.
Galef, J. L.

Circuit Breakers
General Electric Co.
Westinghouse Elec. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. M. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
WestinghouseElec . & M. Co.

Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
Ohio Brass Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coils, Armature and Field
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Coil Banding and Winding Machines
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Westinghouse Elec. & M. Co.

Coils, Choke and Kicking
Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Coin-Counting Machines
Cleveland Fare Box Co.
Galef, J. L.
International Register Co. The
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Galef, J. L.

Coin Wrappers
Cleveland Fare Box Co.
Galef, J. L.

Commutator Slotters
Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.

Compressors, Air, Portable
Ingersoll-Rand Co.

Compressors, Gas
Ingersoll-Rand Co.

Concrete Flooring Surface
Irving Iron Works

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll Rand Co.
Westinghouse Elec. & M. Co.

Condensor Papers
Irvington Varnish & Ins. Co.

Conduits, Underground
Std. Underground Cable Co.

Connectors, Solderless
Westinghouse Elec. & M. Co.

Connectors, Trailer Car
Consolidated Car Heating Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Allis-Chalmers Mfg. Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Controller Regulators
Electric Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse Elec & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Conveying and Hoisting Machinery
Columbia M. W. & M. I. Co.

Copper Wire
Anaconda Copper Mining Co.
Rome Wire Co.

Cord, Bell, Trolley, Register, etc.
Brill Co., The J. G.
Electric Service Supplies Co.
International Register Co., The
Roeblings Sons Co., John A.
Samson Cordage Works

Cord Connectors and Couplers
Electric Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Cranes
Allis-Chalmers Mfg. Co.

Cross Arms (See Brackets)

Crossings
Ramapo Ajax Corp.

Crossing Foundations
International Steel Tie Co.

Crossing Frogs and Switches
Ramapo Ajax Corp.

Crossings, Manganese
Bethlehem Steel Co.
Indianapolis Switch & Frog Co.
Ramapo Ajax Corp.

Crossing Signals .See Signal Systems, Highway Crossing)

Crossings, Track, (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Crushers, Rock
Allis-Chalmers Mfg. Co.

Curtains and Curtain Fixtures
Brill Co., The J. G.
Electric Service Supplies Co.
Morton Mfg. Co.

Cutouts
Johns Pratt Co.

Dealers' Machinery
Electric Equipment Co.
Transit Equipment Co.

Derailing Switches, Tee Rail
Ramapo Ajax Corp.

Destination Signs
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.

Detective Service
Wish Service, P. Edward

Door Operating Devices
Consolidated Car Heating Co.
National Pneu. Co, Inc.
Safety Car Devices Co.

Doors and Door Fixtures
Brill Co., The J. G.
General Electric Co.
Hale-Kilburn Co.
St. Louis Car Co.

Doors, Folding Vestibule
National Pneumatic Co., Inc.

Draft Rigging, (See Couplers)

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
American Steel & Wire Co.
Electric Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Electric Service Supplies Co.

Ears
Ohio Brass Co.

Electric Grinders
Railway Track-work Co.

Electrodes, Carbon
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Electrodes, Steel
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Electrical Wires and Cables
American Elec. Works
Roeblings Sons Co., J. A.
Rome Wire Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. E.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbens, J. Rowland
Buchanan & Laying
Byllesby & Co., H. M.
Day & Zimmerman, Inc.
Drum & Co., A L.
Feustel, Robert M.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Railway Audit & Inspection Co.
Richey, Albert S.
Dwight P. Robinson & Co.
Sanderson & Porter
Shaw, Henry M.
Stevens & Wood, Inc.
Stone & Webster
Wortham, Edwin

Engineers Inspecting & Chemists
Pittsburgh Testing Laboratory

Engines, Gas, Oil and Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse Elec. & M. Co.

Expansion Joints, Track
Wharton, Jr., & Co., Inc., Wm.

Fare Boxes
Cleveland Fare Box Co.
Galef, J. L.
Nat'l Ry. Appliance Co.
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.
Cyclone Fence Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Electric Service Sup. Co.
Star Brass Works

Fibre and Fibre Tubing
Westinghouse Elec. & M. Co.

Field Coils (See Coils)

Flangeway Guards
Godwin Co., Inc., W. S.

Flaxlinum Insulation
Nat'l Ry. Appliance Co.

Floodlights
Electric Service Sup. Co.

Flooring, Fireproof
Irving Iron Works

Flooring, Non-Slipping
Irving Iron Works

Flooring, Open Steel
Irving Iron Works

Flooring Steel Subway
Irving Iron Works

Flooring, Ventilating
Irving Iron Works

Forgings
Carnegie Steel Co.
Columbia M. W. & M. I. Co.
Standard Steel Works

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track. (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Furnaces, Electric
American Bridge Co.

Fuses Cartridge, Non Refillable & High Voltage
Johns Pratt Co.

Fuses Cartridge, Refillable
Johns Pratt Co.

Fuses and Fuse Boxes
Columbia M. W. & M. I. Co.
Consolidated Car Heating Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Fuses, Refillable
Columbia M. W. & M. I. Co.
General Electric Co.

Gaskets
Westinghouse Tr. Br. Co.

Gas-Electric Cars
General Electric Co.

Gas Producers
Westinghouse Elec. & M. Co.

Gates, Car
Brill Co., The J. G.

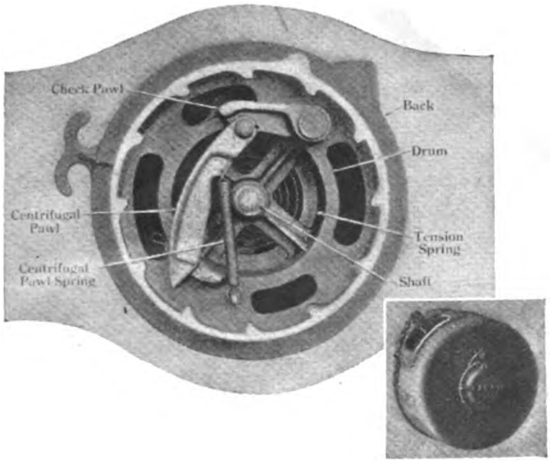
Pneumatic Tie Tampers

Labor aiding tools that enable a small gang to equal the work output of two to three times the same number of men working by hand. Pneumatic tampers also make a uniform, smooth and firm track that stands up twice as long as that tamped by hand.

Ask for actual performance reports on the savings made by pneumatic tamping methods and other labor-saving air tools in track work.

INGERSOLL-RAND COMPANY
11 Broadway, New York
Offices in all principal domestic and foreign cities
For Canada refer Canadian Ingersoll-Rand Company, Limited
260 St. James Street, Montreal, Quebec

201-TT



Ever stop your watch by winding it?

Overwinding will put the average retriever or catcher out of action. Added maintenance expense.

EARLL
Catchers and Retrievers

cannot be overwound. The one-piece tension spring maintains steady even tension throughout long years of service. It requires a minimum of winding effort, saving time, avoiding delays.

This and four other exclusive Earll Catcher and Retriever Features are vitally important. Get the whole story.

C. I. Earll York, Pa.

Griffin Wheel Company

McCormick Building
Chicago, Ill.

GRIFFIN F. C. S. WHEELS

For Street and Interurban Railways

FOUNDRIES:

Chicago
Detroit
Denver
Boston
Kansas City
Council Bluffs
St. Paul
Los Angeles
Tacoma

Gear Blanks
Bethlehem Steel Co.
Carnegie Steel Co.
Standard Steel Works

Gear Cases
Chillingworth Mfg. Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Westinghouse Elec. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
English Electric Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co., The

Goggles, Safety
Indianapolis Switch & Frog Co.

Gongs (See Bells and Gongs)

Grating, Steel Subway
Irving Iron Works

Greases (See Lubricants)

Grinders and Grinding Supplies
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Blocks and Wheels
Railway Track-work Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

Guards, Cattle
American Bridge Co.

Guards, Trolley
Electric Service Sup. Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Headlights
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.

Heaters, Car (Electric)
Consolidated Car Heating Co.
Gold Car Heating & Lighting Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Electric Service Sup. Co.
Smith Heater Co., Peter Wm.

Helmets, Welding
Indianapolis Switch & Frog Co.
Railway Track-work Co.

Hoists and Lifts
Columbia M. W. & M. I. Co.

Hoists, Portable
Ingersoll-Rand Co.

Hose, Bridge
Ohio Brass Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating, Signals
Nichols-Lintern Co.
Oskel Equipment Co.

Inspecting Engineers & Chemists
Pittsburgh Testing Laboratory

Instruments, Measuring, Testing and Recording
Electric Service Sup. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Insulating Cloth, Paper and Tape
Anchor Webbing Co.
General Electric Co.
Hope Webbing Co.
Irvington Varnish & Ins. Co.
Okonite Co.
Standard Underground Cable Co.
Westinghouse E. & M. Co.

Insulating Machinery
Amer. Ins. Machinery Co.

Insulating Silk
Irvington Varnish & Ins. Co.

Insulating Varnishes
Irvington Varnish & Ins. Co.

Insulation (See also Paints)
Anderson M. Co., A. & J. M.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
Westinghouse Elec. & M. Co.

Insulation Cloth Paper & Tape
Mica Insulator Co.

Insulation, Slot
Irvington Varnish & Ins. Co.

Insulator Pins
Electric Service Sup. Co.
Hubbard & Co.

Insulators (See also Line Material)
Anderson M. Co., A. & J. M.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co.
Westinghouse Elec. & M. Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Hoists and Lifts)
Buckeye Jack Mfg. Co.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
National Ry. Appliance Co.
Templeton Kenly & Co.

Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.

Junction Boxes
Standard Underground Cable Co.

Lamp Guards and Fixtures
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc and Incandescent (See also Headlights)
Anderson M. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Arresters
Shaw, Henry M.

Lightning Protection
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Westinghouse Elec. & M. Co.

Line Material (See also Brackets, Insulators, Wires, Etc.)
Anderson M. Co., A. & J. M.
Archbold-Brady Co.
Columbia M. W. & M. I. Co.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
English Electric Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Westinghouse Elec. & M. Co.

Locomotives, Electric
General Electric Co.
Westinghouse Elec. & M. Co.

Lubricating Engineers
Galena-Signal Oil Co.
Texas Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Oil Co.
Texas Co.
Universal Lubricating Co.

Lumber (See Poles, Ties, etc.)

Machine Tools
Columbia M. W. & M. I. Co.

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.
Indianapolis Switch & Frog Co.

Manganese Steel Switches, Frogs and Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters, Car Watt-Hour
Economy Electric Devices Co.

Mica
Mica Insulator Co.

Motor and Generator Sets
General Electric Co.

Motor Buses
(See Buses, Motor)

Motormen's Seats
Brill Co., The J. G.
Electric Service Sup. Co.
St. Louis Car Co.
Wood Co., Chas. N.

Motors, Electric
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Nuts and Bolts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia M. W. & M. I. Co.
Hubbard & Co.

Oils (See Lubricants)

Oxygen
International Oxygen Co.

Packing
Electric Service Sup. Co.
Westinghouse Tr. Br. Co.

Paints & Varnish Preservatives
Beckwith-Chandler Co.

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co.

Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdry. Co.

Pickups, Trolley Wire
Electric Service Sup. Co.
Ohio Brass Co.

Pinion Pullers
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Electric Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Pipe
National Tube Co.

Pipe Fittings
Standard Steel Works

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Electric Service Sup. Co.

Pneumatic Tools and Accessories
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Pole Reinforcing
Drew Elec. & Mfg. Co.
Hubbard & Co.

Poles and Ties, Treated
Bell Lumber Co.

Poles, Metal Street
Bates Expanded Steel Truss Co.
Electric Ry. Equip. Co.
Hubbard & Co.

Poles, Ties, Posts, Piling and Lumber
Bell Lumber Co.

Poles, Trolley
Anderson M. Co., A. & J. M.
Columbia M. W. & M. I. Co
National Tube Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equip. Co.
Electric Service Sup. Co.
National Tube Co.

Porcelain, Special High Voltage
Lapp Insulator Co.

Potheads
Okonite Co.

Power Saving Devices
Nat'l Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Westinghouse Elec. & M. Co

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
International Register Co., The
Wood Co., Chas. N

Rail Braces and Fastenings
Ramapo Ajax Corp.

Rail Joints
Carnegie Steel Co.

Rail Joints, Welded
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.

Rail Grinders (See Grinders)

Rails, Steel
Carnegie Steel Co.

Railway Safety Switches
Consolidated Car Heating Co.
Westinghouse Elec. & M. Co.

Railway Welding (See Welding Processes)

Rail Welding
Metal & Thermit Corp.
Rail Welding & Bonding Co.

Rattan
Brill Co., The J. G.
Electric Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Electric Service Sup. Co.
International Reg. Co., The
Ohmer Fare Register Co.
Rooke Automatic Reg. Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.

Repair Work (See also Coils)
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Replacers, Car
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.

Resistance, Grid
Columbia M. W. & M. I. Co.

Resistance, Wire and Tube
General Electric Co.
Westinghouse Elec. & M. Co.

Resistances
Consolidated Car Heating Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse Elec. & M. Co.

Sanders, Track
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.

Sash Fixtures, Car
Brill Co., The J. G.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Electric Service Sup. Co.

Seating Materials
Brill Co., The J. G.

Seats, Bus
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Corp.
St. Louis Car Co.

Second-Hand Equipment
Electric Equipment Co.
Sachsenmaier Co., Geo.
Standard Rail & Steel Co.
Transit Equipment Co.
Zelnicker Supply Co., W. A.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Hubbard & Co.

Shovels, Power
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.

Signals, Car Starting
Consolidated Car Heating Co.
Electric Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Block
Electric Service Sup. Co.
Nachod Signal Co., Inc.
Union Switch & Signal Co.
U. S. Electric Signal Co.
Wood Co., Chas. N.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
U. S. Electric Signal Co.

Slack Adjusters (See Brake Adjusters)

Slag
Carnegie Steel Co.

Sleet Wheels and Cutters
Anderson M. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Electric Ry. Equip. Co.
Electric Service Sup. Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car Fender Co.

Snow Sweeper, Rattan
Heywood-Wakefield Co.

Soldering and Brazing (See Welding Processes and Apparatus)

Spikes
Amer. Steel & Wire Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co., The

Splicing Compounds
Westinghouse Elec. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Standard Steel Works
Taylor Electric Truck Co.

Sprinklers, Track and Road
Brill Co., The J. G.

Stair Steps, Safety
Irving Iron Works

Steel and Steel Products
Morton Mfg. Co.

Steps, Car
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse Elec. & M. Co.

Stop, Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Subway Boxes
Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switch Stands
Indianapolis Switch & Frog Co.
Ramapo Ajax Corp.

Switches, Safety
Johns-Pratt Co.

Switches and Switchboards
Allis-Chalmers Mfg. Co.
Anderson M. Co., A. & J. M.
Electric Service Sup. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track, Special Work)

Tampers, Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail, Special Track Work
Bethlehem Steel Co.
Rampo Ajax Corp.

Telephones and Parts
Electric Service Sup. Co.

Terminals, Cable
Standard-Underground Cable Co.

Testing Devices, Meter
Johns Pratt Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heating Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers and Destroyers
Electric Service Sup. Co.

Ties, All Metal
Metal Safety R'way Tie Co.

Ties and Tie Rods, Steel
American Bridge Co.
Carnegie Steel Co.
Godwin Co., Inc., W. S.
International Steel Tie Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

We Will Build This Attractive
PAGODA
FREE

for your Amusement Park

This handsome Pagoda root beer stand will be a big addition to your amusement park.

We will build this Pagoda in your amusement park, equip it fully with a Richardson Root Beer Barrel. It won't cost you anything—the concession privileges actually will pay you money.

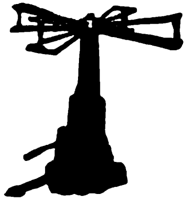
Send for our proposition now. There's time to have the pagoda all ready for this season.

C. M. Walker Corporation
Rochester, N. Y.

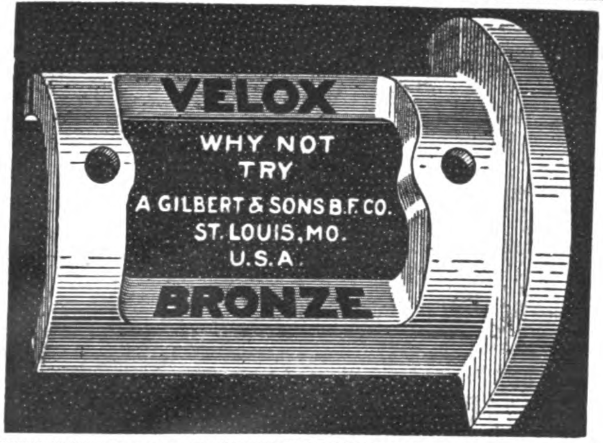
Quality is remembered when price is long forgotten.
That's why "Tool Steel" gears and pinions are increasingly popular.

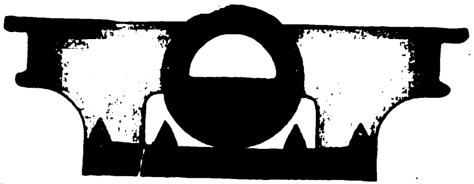
Tool Steel Quality

The Tool Steel Gear and Pinion Co.
CINCINNATI, O.



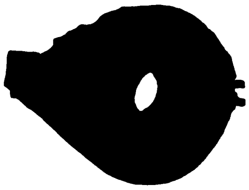
Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars
Perey Manufacturing Co., Inc.
30 Church Street, New York City


VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE



STUCKI
SIDE
BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.

HALE-KILBURN
CAR SEATS
For Every Class of Service
General Offices and Works: Philadelphia
Offices: New York, Chicago, St. Louis, Washington, San Francisco



CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. *Write Us.*
Chillingworth Mfg. Co.
Jersey City, N. J.

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED

No.
478E
GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

Tool Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Tools, Track and Misc.
Amer. Steel & Wire Co.
Columbia M. W. & M. I. Co.
Electric Service Sup. Co.
Hubbard & Co.
Railway Track-work Co.

Towers and Transmission Structures
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Westinghouse Elec. & M. Co.

Track Grinders
Metal & Thermit Corp.
Railway Track-Work Co.

Trackless Trollicars
Brockway Motor Truck Co.
Pierce-Arrow Motor Car Co.
St. Louis Car Co.

Track, Special Work
Bethlehem Steel Co.
Columbia M. W. & M. I. Co.
Indianapolis Switch & Frog Co.
New York Switch & Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., Wm.

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co

Transmission Towers & Structures
Amer. Bridge Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson M. Co., A. & J. M
Electric Service Sup. Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Anderson M. Co., A. & J. M
Electric Service Sup. Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse Elec. & M. Co.

Trolley Materials
Electric Service Sup. Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolley Shoes
Economy Elec. Devices Co.
Miller Trolley Shoe Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wheels, Bushings
More-Jones Brass & Metal Co.

Trolley Wheels & Harps
More-Jones Brass & Metal Co.

Trolley Wire
American Elec'l Works
Amer. Steel & Wire Co.
Anaconda Copper Mining Co
Roeblings Sons Co., J. A.
Rome Wire Co.

Trucks, Car
Brill Co., The J. G.
Bemis Car Truck Co.
St. Louis Car Co.
Taylor Electric Truck Co.
Westinghouse Elec. & M. Co

Tubing, Steel
National Tube Co.

Tubing, Yellow & Black Flexible Varnishes
Irvington Varnish & Ins. Co

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & M. Co.

Turbiner Water
Allis-Chalmers Mfg. Co.

Turnstiles
Electric Service Supplies Co
Perey Mfg. Co., Inc.

Turntables
Indianapolis Switch & Frog Co.

Vacuum Impregnation
Allis-Chalmers Mfg. Co.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers
Irvington Varnish & Ins. Co.

Varnish Silks
Irvington Varnish & Ins. Co.

Varnishes (See Paints, etc.)

Ventilators, Car
Brill Co., The J. G.
National Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Welded Rail Joints
Alumino-Thermic Corp.
Electric Ry. Improvement Co.
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.

Welders, Portable Electric
Electric Ry. Imp. Co.
Indianapolis Switch & Frog Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co

Welding and Cutting Tools
International Oxygen Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
General Electric Co.
Indianapolis Switch & Frog Co.
Metal & Thermit Corp.
National Ry. Appliance Co
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
Westinghouse Elec. & M. Co

Welding Steel
Electric Ry. Improvement Co.
Indianapolis Switch & Frog Co.
Railway Track-work Co

Wheel Guards (See Fenders and Wheel Guards)

Wheel Grinders
Wheel Truing Brake Shoe Co.

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Assn. of Mfrs. of Chilled Car Wheels
Griffin Wheel Co.

Wheels, Car, Steel & Steel Tire
Carnegie Steel Co.
Standard Steel Works

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Electric Ry. Equip. Co.
Elec. Service Supplies Co.
General Electric Co.
Gilbert & Sons, B. F. A.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Wire Rope
Amer. Steel & Wire Co.
Roeblings Sons Co., J. A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Okonite Co.
Roeblings Sons Co., J. A. Co.
Rome Wire Co.
Standard Underground Cable Co
Westinghouse Elec. & M. Co.

Wood Preservatives
Baker Wood Preserving Co

Woodworking Machinery
Allis-Chalmers Mfg. Co.

ALPHABETICAL INDEX TO ADVERTISERS

	Page
Allis-Chalmers Mfg. Co.	37
Allison Co., J. E.	20
Alumino-Thermic Corp.	42
Amer. Brake Shoe & Fdy. Co.	39
American Car Co.	53
American Electrical Works	41
American Insulating Machinery Co.	42
American Steel & Wire Co.	42
Anaconda Copper Mining Co.	41
Anchor Webbing Co.	43
Anderson Mfg. Co., A. & J. M.	36
Archbold-Brady Co.	21
Arnold Co., The	20
Assn. of Mfrs. of Chilled Car Wheels	33
Babcock & Wilcox Co.	43
Bates Expanded Steel Truss Co.	10
Beckwith-Chandler Co.	44
Beeler, John A.	20
Bell Lumber Co.	52
Bemis Car Truck Co.	30
Bethlehem Steel Co.	25
Bibbins, J. Rowland	20
Bonney-Vehslage Tool Co.	44
Brill Co., The J. G.	53
Buchanan & Layng Corp.	21
Buckeye Jack Mfg. Co.	43
Byllesby & Co., H. M.	21
Cameron Electrical Mfg. Co.	43
Carnegie Steel Co.	26
Chillingworth Mfg. Co.	51
Cleveland Fare Box Co.	45
Collier, Inc., Barron G.	28
Columbia M. W. & M. I. Co.	32
Consolidated Car Fender Co.	37
Consolidated Car Heating Co.	45
Cyclone Fence Co.	31
Day & Zimmermann, Inc.	21
Differential Steel Car Co., The	46
Drum & Co., A. L.	20
Earll, C. I.	49
Electric Equipment Co.	47
Electric Ry. Equipment Co.	41
Elec. Ry. Improvement Co.	35
Electric Service Supplies Co.	9
English Electric Co.	A
"For Sale" Ads.	47
Ford, Bacon & Davis	20
Foster Co., L. B.	27
Galef, J. L.	45
Galena-Signal Oil Co.	17
General Electric Co.	18, Back Cover
Gilbert & Sons, B. F. Co., A.	51
Godwin & Co., Inc., W. S.	42
Gold Car Heating & Ltg. Co.	51
Griffin Wheel Co.	49
Hale-Kilburn Co.	51
"Help Wanted" Ads	47
Hemphill & Wells	20
Heywood-Wakefield Co.	44
Holst, Englehard W.	20
Hope Webbing Co.	44
Hubbard & Co.	42
Indianapolis Switch & Frog Co.	24
Ingersoll-Rand Co.	49
International Oxygen Co.	43
International Register Co., The.	45
International Steel Tie Co., The.	7
Irving Iron Works Co.	36
Irvington Varnish & Insulator Co.	44
Jackson, Walter	20
Jeandron, W. J.	39
Johns-Pratt Co.	42
Johnson & Co., Inc., J. R.	51
Johnson Fare Box Co.	45
Kuhlman Car Co.	53
Lapp Insulator Co., Inc.	41
Le Carbone Co.	39
Lorain Steel Co.	43
McGraw-Hill Book Co., Inc.	21
McGuire-Cummings Mfg. Co.	16
Metal & Thermit Corp.	35
Metal Safety Railway Tie Co.	42
Mica Insulator Co.	44
Miller Trolley Shoe Co.	15
More-Jones Brass & Metal Co.	46
Morganite Brush Co.	40
Morton Mfg. Co.	52
Nachod Signal Co	41
National Brake Co.	19
National Pneumatic Co., Inc.	11
National Ry. Appliance Co.	46
National Tube Co.	22
New York Switch & Crossing Co.	42
Nichols-Lintern Co.	52
Nuttall Co., R. D.	38
Ohio Brass Co.	5
Ohmer Fare Register Co.	45
Okonite Co., The	42
Ong, Joe R.	20
Oskel Equipment Co.	45
Parsons, Klapp, Brinckerhoff & Douglas	21
Perey Mfg. Co., Inc.	51
Pittsburgh Testing Laboratory.	43
Positions Wanted and Vacant	47
Rail Welding & Bonding Co.	14
Railway Audit & Inspection Co.	21
Railway Track-work Co.	6
Railway Utility Co.	45
Ramapo Ajax Corp.	41
Richey, Albert S.	20
Robinson Co., Dwight P.	21
Roebling's Sons Co., John A.	41
Rome Wire Co.	40
Rooke Automatic Register Co.	44
Safety Car Devices Co.	12
St. Louis Car Co.	39
Samson Cordage Works	Front Cover
Sanderson & Porter	20
Searchlight Section	47
Shaw, Henry M.	41
Smith Heater Co., Peter	44
Standard Steel Works Co.	34
Standard Underground Cable Co.	41
Star Brass Works	46
Stevens & Wood, Inc.	20
Stone & Webster	20
Stucki Co., A.	51
Taylor Electric Truck Co.	46
Templeton, Kenly & Co.	23
The Texas Co.	29
Thomas Car Works, Perley A.	38
Tool Steel Gear & Pinion Co.	51
Transit Equipment Co.	47
Union Switch & Signal Co.	8
U. S. Electric Signal Co.	41
Universal Lubricating Co.	46
"Want" Ads	47
Walker Corp., C. M.	51
Wason Mfg. Co.	53
Westinghouse Elec. & Mfg. Co.	2, 4
West'gh'se Traction Brake Co.	13
Wheel Truing Brake Shoe Co.	46
White Eng. Corp., The J. G.	20
Wish Service, The P. Edw.	21
Wood Co., Chas. N.	41
Wortham, Edwin	20

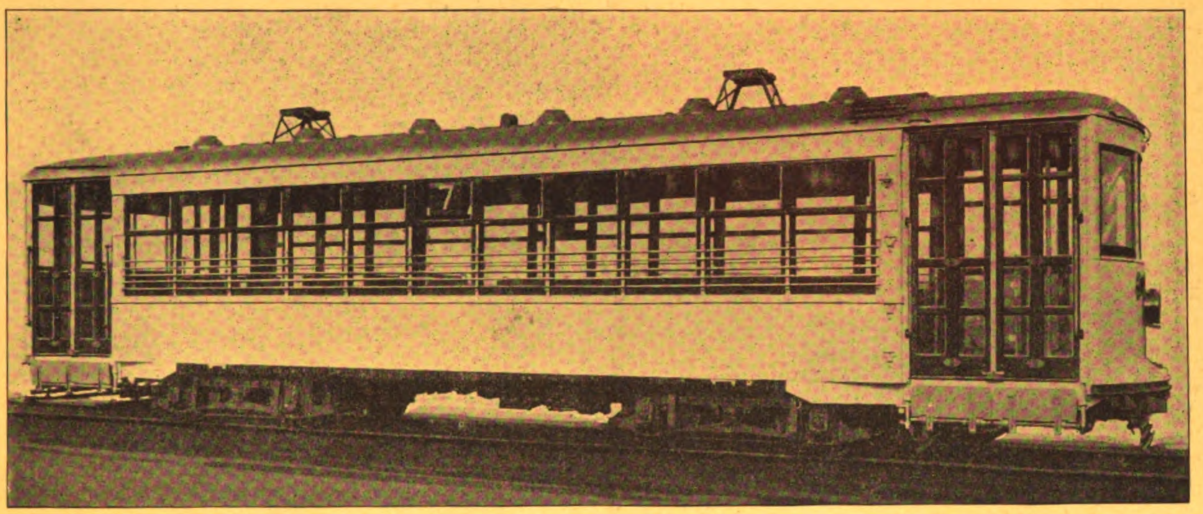
100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

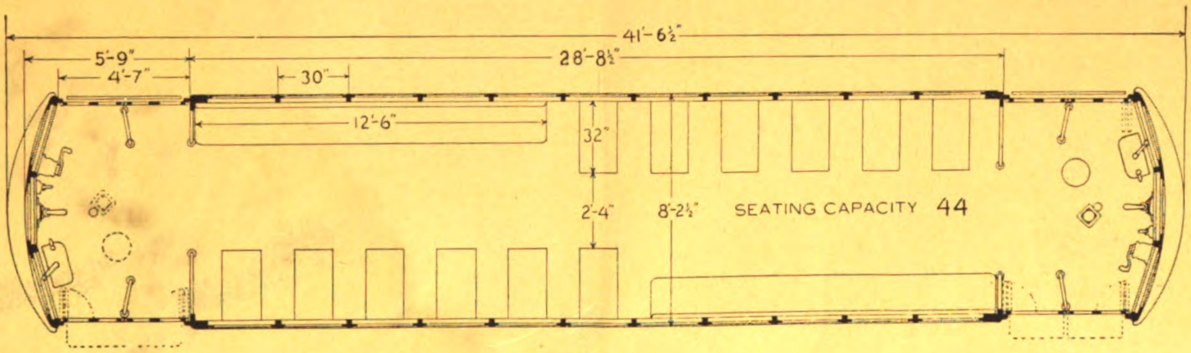
Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

N-L VENTILATORS
for Electric Railways and Motor Buses.
Unexcelled for ventilation and appearance.
Write for new catalogue
THE NICHOLS-LINTERN COMPANY
7960 Lorain Ave., Cleveland, Ohio
N-L Products manufactured and sold in Canada by
Railway and Power Engineering Corporation, Ltd.
133 Eastern Avenue, Toronto, Ontario

The Most Successful Men in the Electric Railway
Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

SACRAMENTO





Light-Weight Double-End Cars

Brill 77-E1 Trucks

Another company to take advantage of the economical advantages of light-weight car equipment is the Pacific Gas & Electric Company, which operates all the street-railway lines in Sacramento, Cal. Five cars of the type illustrated, recently delivered by the American Car Company, are mounted on Brill Light-Weight Car Trucks No. 77-E1, propelled by one 40 Hp. motor on each truck.

The body length is 28 ft. 8½ in.; length over platforms, 41 ft. 6½ in; seating capacity, 44. These cars weigh ready for operation 28,216 lbs.

Our Light-Weight Car Catalog No. 266 will be mailed upon request.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO.
G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO
WASON MANF'G CO. SPRINGFIELD, MASS.

BROADWAY
4
EXIT AT REAR
513
513
513
CP-27
GE-264

Lighter Weight in Fort Wayne

Another installation where GE-264 Motors, K-Control with Line Breakers, and CP Compressors are proving successful.

The Indiana Service Corporation, Fort Wayne, has in operation 15 cars, 31,000 lb. complete, with this equipment.

25-227

General Electric Company
Schenectady, N. Y.

GENERAL ELECTRIC

TF
701
E7

McGraw-Hill Co., Inc. 12, 1924 Twenty Cents Per C y

ELECTRIC RAIL
J L

Typifying Permanent Endurance

Buffeted by wind and storm; constantly attacked by heat and cold, by the arcing of uneven trolley wheels, and by current overloads—Phono-Electric has won its spurs for endurance in a hard school.

More than twenty years has passed since this thrice-tougher than copper trolley wire was first introduced. During those twenty years many a record for long life has been made and broken. And today finds Phono-Electric installed in ever-increasing mileage on America's leading electric railways. For endurance becomes synonymous with economy where trolley wire is concerned.

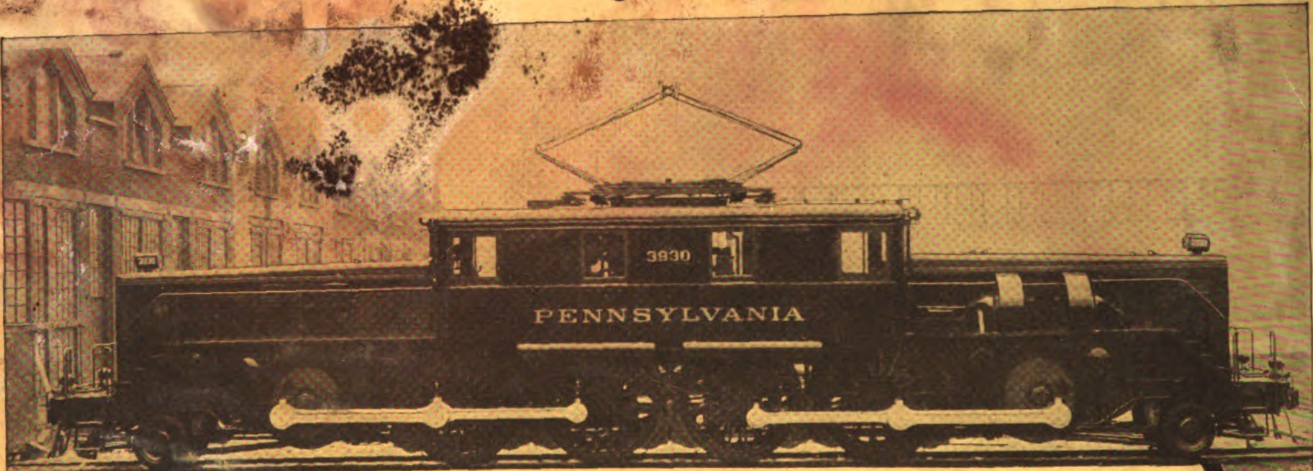
Details on request.

Electric Furnace Products

Bridgeport Brass Company
BRIDGEPORT - CONNECTICUT
NEW YORK CHICAGO PHILADELPHIA DETROIT
Members Copper and Brass Research Association

"Bridgeport"
TRADE BRASS CO. MARK
Phono-Electric
WE MAKE
Ledrite Brass Rod
Phono-Electric Contact Wire
Plumrite Brass Pipe
Phono-Hi-Strength Wire
Tubular Plumbing Goods
Condenser Tubes - Sugar Tubes
Brass, Bronze and Copper Sheets
Brass, Bronze and Copper Tubes
Auto Bicycle and Pressure Pumps
Auto Accessories - Stampings
Engravers' Copper - Specialties
Screw Machine Products
Pressed or Drawn Products
Oil and Grease Guns

A New Single-Phase Locomotive For The Pennsylvania Railroad



Single-Phase, 3260 Horse-Power Locomotive for Preference-Freight Service on the Pennsylvania Railroad.

The Pennsylvania Systems' latest Electric Locomotive has the following distinctive features:

Largest capacity single-phase motors ever built in this country.

New type of flexible gear, with highest duty in locomotive service.

First flexible pinion used on locomotives in the United States.

Oil-insulated, force-cooled transformer.

Automatic oiling system for jackshaft and motor bearings.

One rigid driving-wheel base.

Apparatus mounted directly on engine frame.

Individual blowers for cooling apparatus.

Accessibility for inspection and maintenance.

Availability for either freight or passenger service by simply changing gear ratio.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

W WESTINGHOUSE ELECTRIC

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

Westinghouse

Vol. 63, *No.* 15 New York, April 12, 1924 *Pages* 567-602

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

MORRIS BUCK
Associate Editor
C. W. SQUIER
Associate Editor
JOHN A. MILLER, JR.
Assistant Editor
G. J. MACMURRAY
News Editor

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago
MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago
CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 567

Rehabilitated Property Attracts Increased Patronage...569
Aurora, Elgin & Fox River Electric Company lines re-equipped as to cars and power facilities. Part of Aurora, Elgin & Chicago Railroad released from receivership through purchase by local power company. New franchises relieve company of paving burden.

New German Cars Have Unique Features.........574

Variable Mill Riding Requires Careful Checking.......575

Hose-Jumpers Sent to Every Fire.........576

Public Relations in San Diego.........576

Toronto's Two and a Half Years of M. O..........577
BY "OBSERVER."
The success of the system may be attributed largely to the integrity and progressiveness of the management, rather than to municipal ownership. The property has been completely rehabilitated and the principal lines rerouted. Many other improvements made.

Unified Traffic Control Tried in Los Angeles.........579

Purchasing Energy Saves $15,000 a Year.........579

Daily Statement of Earnings and Expenses.........580

Railway Operates Passenger Automobiles for Intercity Service.........581
Indiana, Columbus & Eastern Traction Company uses seven-passenger touring cars under competitive conditions. Cost of operation is comparatively low. Rules insure careful operation. Regular maintenance reduces road failures.

Bonus for Increased Revenue.........583

Better Illumination with Less Wattage.........584

American Association News.........586

Maintenance of Equipment.........588

News of the Industry.........591

Financial and Corporate.........595

Legal Notes.........599

Personal Mention.........600

Manufactures and the Markets.........601

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA 1924

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingeniería Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $1 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

Copyright, 1924, by McGraw-Hill Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

"They Know All About Them Over Here"

A MANUFACTURER'S representative was making an extended trip through England and Continental Europe, looking into the possible field for several new devices which his company was introducing. To his surprise he found, on interviewing European railway men, that they were already quite familiar with his new products even though they were then just beginning to be used in America.

"They know all about them over here," he said in writing back to his home office. "They have read the articles in the ELECTRIC RAILWAY JOURNAL and have also been following our advertisements in that paper. They have been making plans to try out our new products and seem to be quite familiar with their construction."

Needless to say his home office was agreeably surprised. But the editors of the JOURNAL, on learning of the incident, were not surprised because they have definite knowledge of the wide distribution of the subscribers, and know that a great many foreign as well as nearly all domestic operating men depend on this paper for authentic news of all important electric railway developments.

Number of Copies Printed, 6,035

Advertising Index—Alphabetical, 40; Classified, 36, 38; Searchlight Section, 35

Now note Mr. Pinkley's method:

Under the supervision of Mr. R. H. Pinkley, engineer of way and structures, the Milwaukee Electric Railway & Light Company has acquired a large variety of machine equipment for expediting track maintenance and reconstruction. Before any machine was purchased it had to show adaptability to a wide range of jobs. Moreover, it had to be a machine that would be used advantageously many days every year.

With these specifications clearly in view, Mr. Pinkley's department bought and makes good use of a fine fleet of modern rail grinders.

Three "Atlas" grinders and a "Universal" follow up top welding work at cupped joints and battered special work, a "Reciprocating" removes corrugations, three Swing Frame Grinders rough down Thermit welds and grind the taper in special work throatways.

What are Rail Grinders doing for you? We can tell you what they are doing for many successful roads.

Railway Trackwork Co.

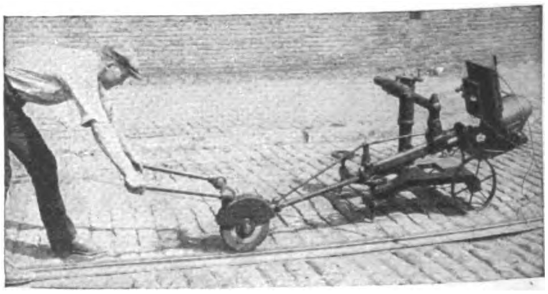
3132-48 East Thompson Street, Philadelphia

AGENTS:

Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London

"Reciprocating" Track Grinder

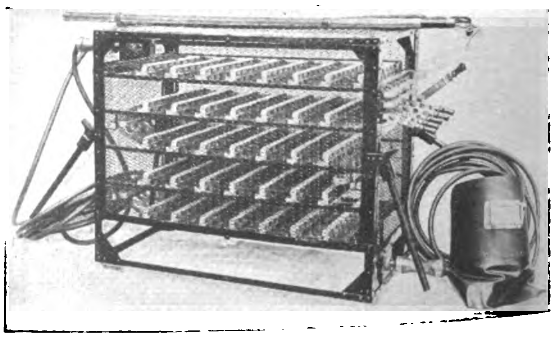
"Universal" Rotary Track Grinder



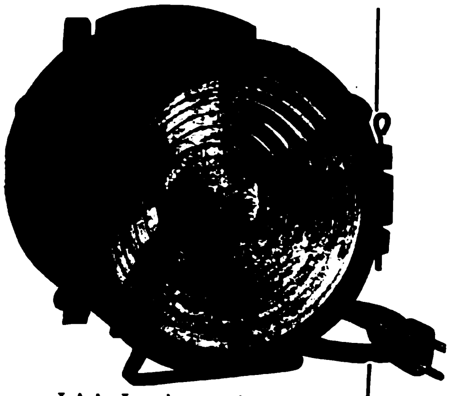
"Hercules" Swing Frame Rail Grinder

ATLAS RAIL GRINDER

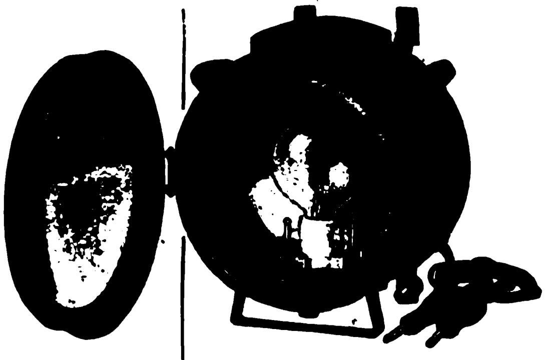
"Atlas" Rail Grinder



"Ajax" Electric Arc Welder



LAA Luminous Arc



DCP—A High-powered Incandescent

Suitable Imperial Illumination for You

Suitable Imperial Headlight Illumination—case design—size—ruggedness—can be specified for your property.

Imperial Headlights come in various sizes and styles, with luminous arc, carbon arc or incandescent elements.

Imperials of the type you choose can give you the same satisfaction that is testified by their standardization on many prominent city and interurban properties.

Imperial Headlights are sold exclusively by the Ohio Brass Co.

ZP Incandescent

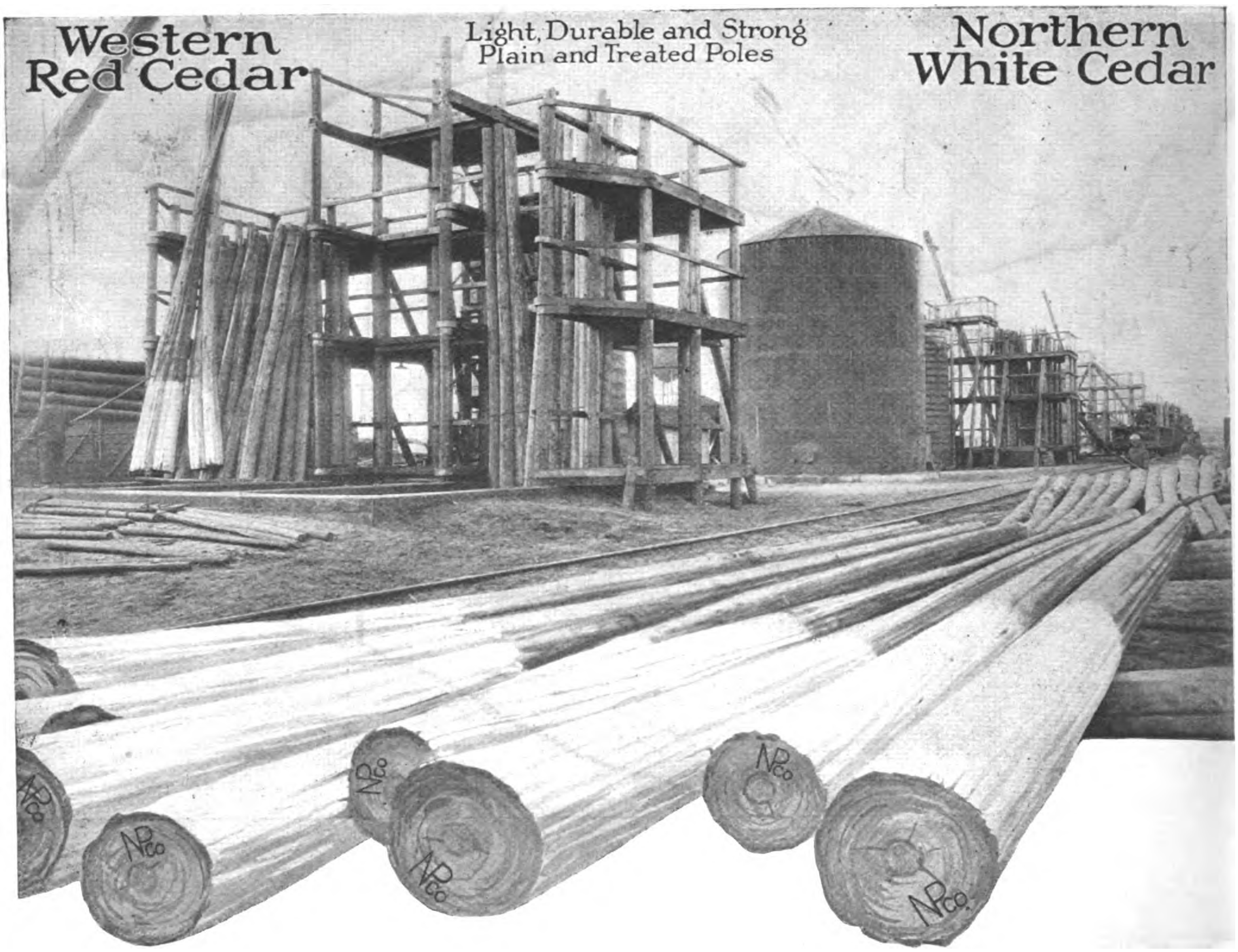
Flush Type

THE OHIO BRASS CO.

Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE


Western Red Cedar
Light, Durable and Strong Plain and Treated Poles
Northern White Cedar
NPCo
NPCo
NPCo
NPCo
NPCo
NPCo

NPCo Every year hundreds of thousands of Western Red Cedar and Northern White Cedar Poles carry this brand mark to pole buyers all over America. It identifies and guarantees the product. And back of it stands the National Pole Company, the largest distributors of cedar poles in the world, with a delivery service that is unapproachable in the entire cedar pole industry.

NATIONAL POLE COMPANY

Escanaba, Michigan

Western Electric Company

Distributors:

Offices in 47 principal cities.

Steel Twin Tie Track

Heavier than Air Facts on STEEL TIE TRACK

First Installation 1910, Altoona—Open Track—Service; 20 ton cars, fifteen minute headway for nineteen hours per day. Engineer says: "There is no apparent deterioration with Steel Ties."

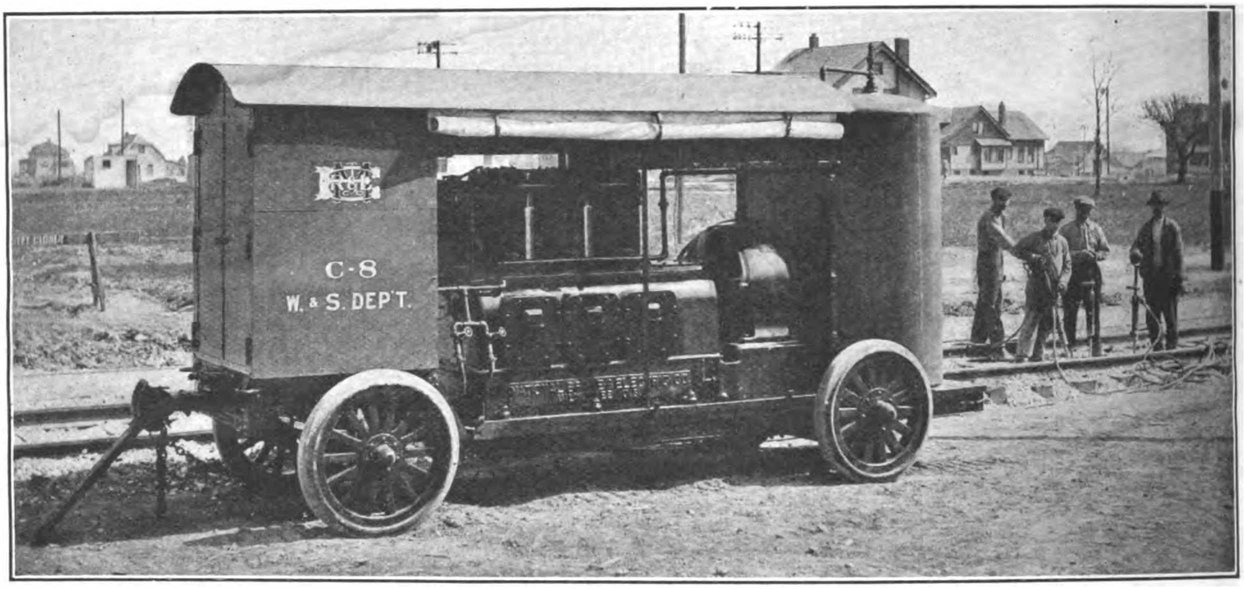
Installation Anderson, Indiana, 1911—City and Interurban.—Traffic check 13,458,960 ton-wheels. Engineer says: "None of track shown, nor any of this type of construction on our property, has cost anything for maintenance since it was installed."

Our largest and oldest user (first installation 1911) has standardized on Steel Twin Ties for all new construction and reconstruction.

A two year old test renewal installation has demonstrated that new rail and paving may be placed on old Steel Tie Foundation.—34th Street Bridge, Broadway Line, Cleveland, Ohio.

Write for proposal folder, including delivered price

The INTERNATIONAL STEEL TIE COMPANY
CLEVELAND, OHIO



One of the Westinghouse-National Compressors used by the Milwaukee Electric Railway & Light Company.

—it's a

WESTINGHOUSE-NATIONAL

—that is sufficient recommendation for anyone who has had experience with an Air Compressor of this famous make.

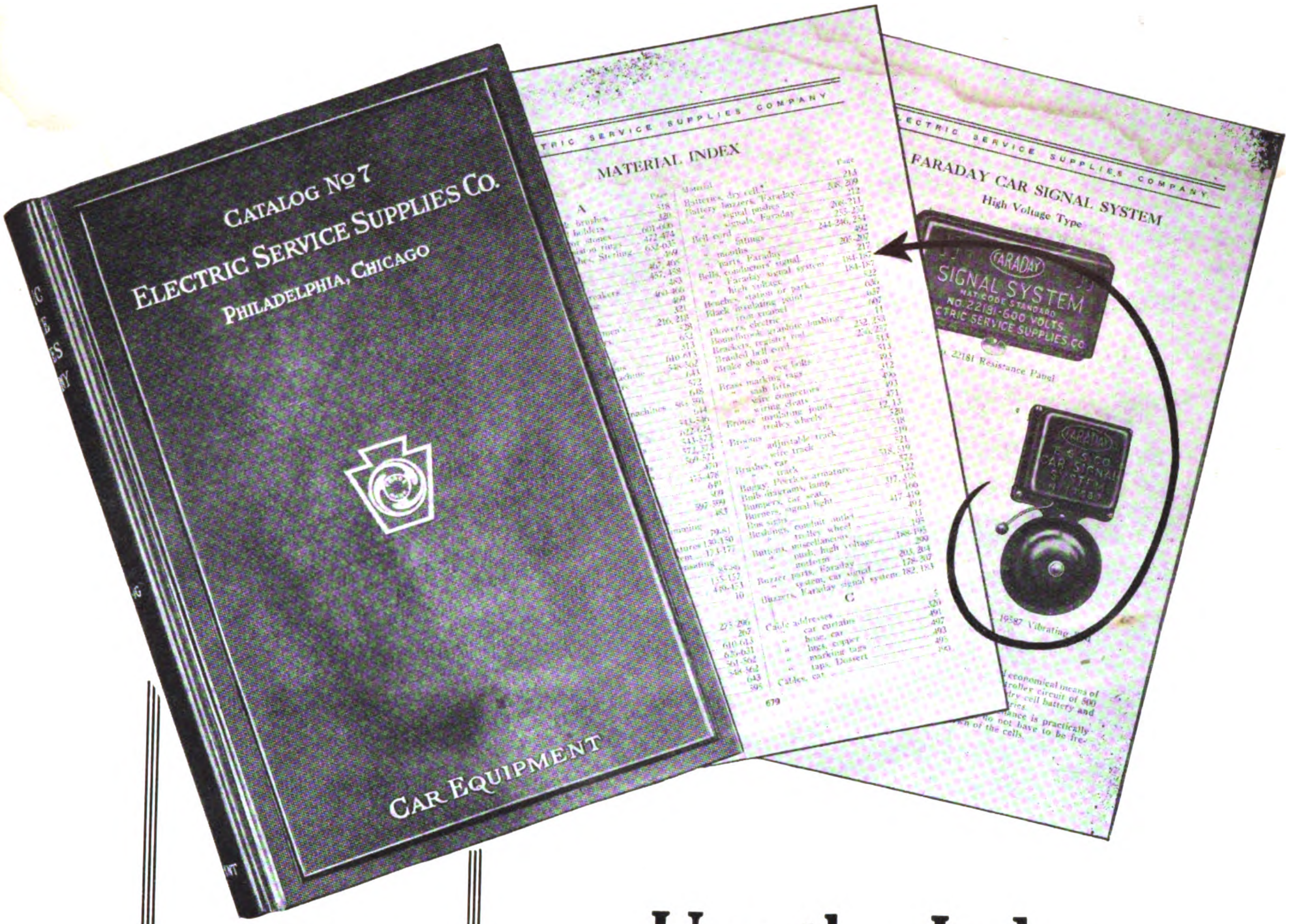
We furnish models suitable for any class of way maintenance work—or for Power Plant, Car Barn and Shop installations.

By specifying Westinghouse-National Compressors you get the advantage of the widely-discussed HP Automatic Control, which *saves power and minimizes wear.* In addition, you get a quality of design and construction throughout which assures years of steady, dependable service at extremely low maintenance cost. Performance records are the best proof. Send for Catalog today.

TRADE MARK

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

WESTINGHOUSE—NATIONAL
Air Compressors
"QUALITY MACHINES FOR QUALITY SERVICE"


CATALOG No 7
ELECTRIC SERVICE SUPPLIES CO.
PHILADELPHIA, CHICAGO
CAR EQUIPMENT
ELECTRIC SERVICE SUPPLIES COMPANY
MATERIAL INDEX
FARADAY CAR SIGNAL SYSTEM
High Voltage Type
FARADAY SIGNAL SYSTEM
NO. 2218I-600 VOLTS
ELECTRIC SERVICE SUPPLIES CO.

Use the Index

WHETHER you're looking for Faraday Signal Systems or any other items of car equipment used in designing or maintaining rolling stock, you'll find them in the big ESSCO Catalog No. 7. There's a nine-page index and this index will lead you to a page of illustrations, dimensions, descriptions and data on any device you are considering.

And in choosing from any ESSCO Catalog, you are choosing KEYSTONE EQUIPMENT, time-tried, and dependable.

Get our quotations on your requirements.

Partial list of KEYSTONE Car Equipment

Steel Gear Cases
Motormen's Seats
Lighting Fixtures
Headlight Resistances
Air Sanders
Trolley Catchers
Shelby Trolley Poles
Rotary Gongs
International Fare Registers
Fare Register Fittings
Samson Cordage
Air Valves
Cord Connectors
Trailer Connectors
Automatic Door Signals
Standard Trolley Harps
Standard Trolley Wheels
Segur Coil Winding Tools
Peerless Armature Machines
Insulating Materials
Aetna Commutator Stones
Sand Driers
Peerless Pinion Pullers
Employees' Badges
Line Material
Portable Lamp Guards

ELECTRIC SERVICE SUPPLIES CO.

PHILADELPHIA
17th and Cambria Sts.

NEW YORK
50 Church St.

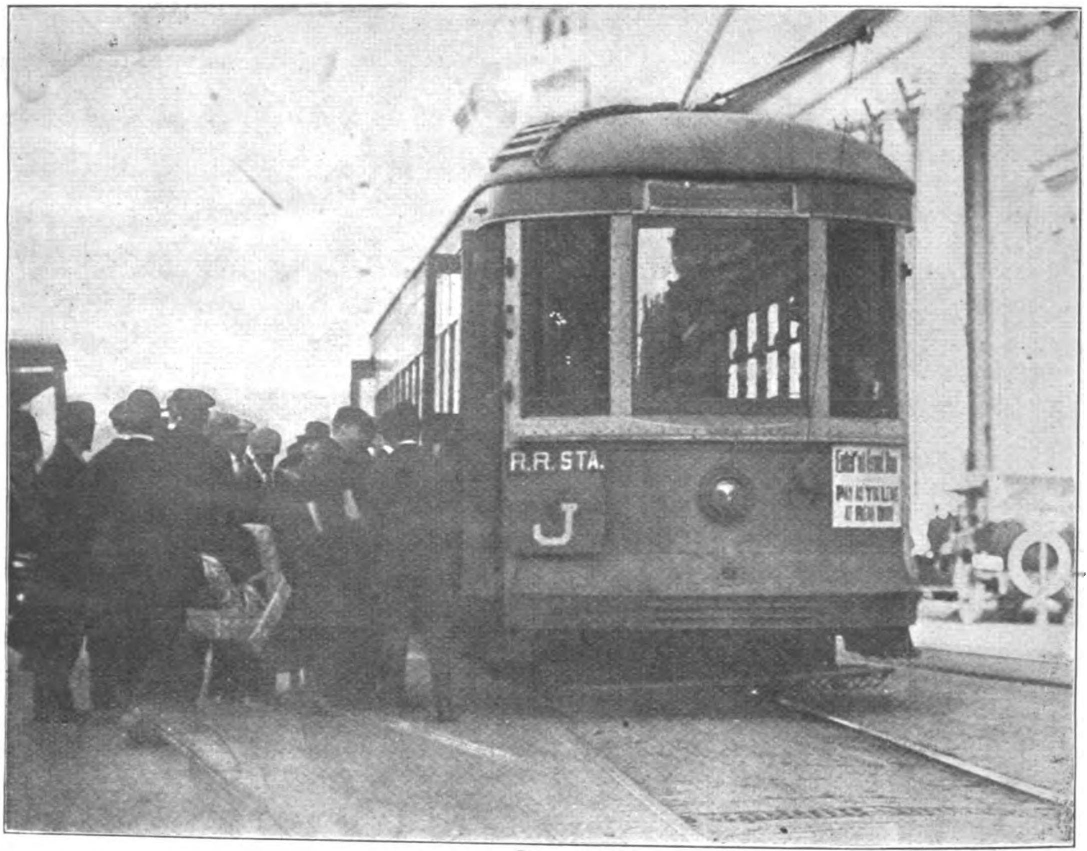
CHICAGO
Monadnock Bldg.

PITTSBURGH
829 Oliver Building

SCRANTON
316 N. Washington Ave.

BOSTON
88 Broad St.

Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver



When the platform man gets mad!

Of course he shouldn't. But—

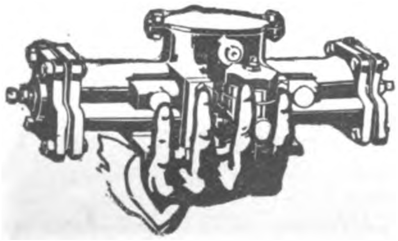
suppose his car is late. Perhaps some passengers have riled his temper a bit. Maybe an inspector along the route has "called him down" for something. Altogether he's in anything but a complacent mood. What does anyone do under such circumstances? Naturally one vents his spleen on the first inanimate object he lays his hands on. *With the car operator, that handiest thing is the door operating equipment.* Bang! He jerks the handle with all the force of an ungoverned wrath. *He takes it out on the doors.*

Maintenance is less with N. P. Door Engines because doors cannot be slammed!

With National Pneumatic Equipment your wrathful operator, your hurrying conductor, your heedless employee may bang the door valve lever as hard as he wants—it has no more effect on the engine and doors than the gentlest maiden's hand. The *automatic valve action* and *reserve cushion* feature of National Pneumatic Door Equipment provide uniformly smooth, quiet and easy operation under all conditions.

Therefore the maintenance is less than on manually-operated doors.

National Pneumatic Company, Inc.
50 Church St., New York Edison Bldg., Chicago
Works: Rahway, N. J.



NEARLY 200 PROPERTIES FULLY EQUIPPED

GRAND RAPIDS

ORDERS

ECONOMY METERS

To Completely Equip Entire System

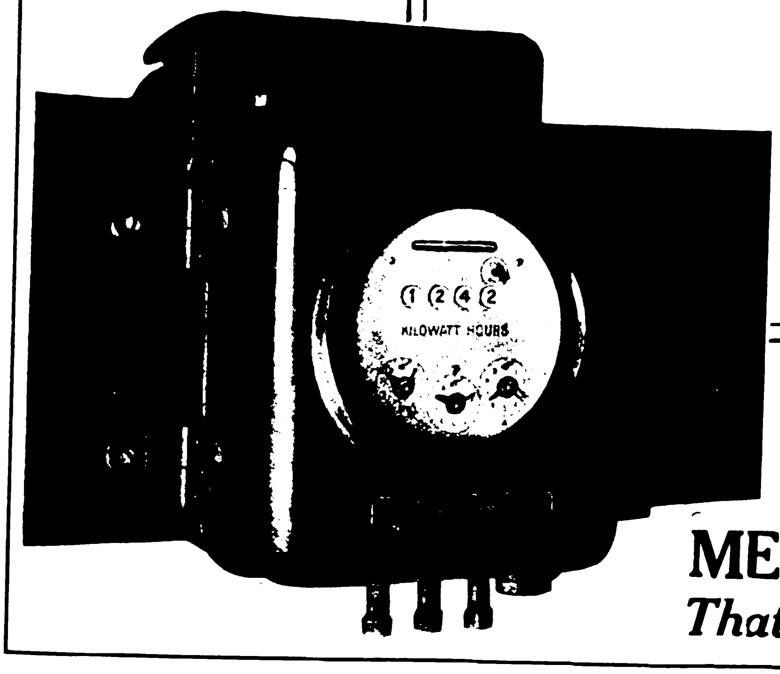
These meters will be used to measure the individual energy consumption of *every car* on the Grand Rapids Railway Company's property. They will afford data of high engineering value and provide a convenient means for car inspection on the basis of actual work done (kw. hours).

Economy Meters are inducing savings from ⅓ to ½ a cent per car mile. It will pay you to investigate whether you are operating one car or three thousand.

Economy Electric Devices Company
L. E. Gould, President.
1592 Old Colony Building, Chicago

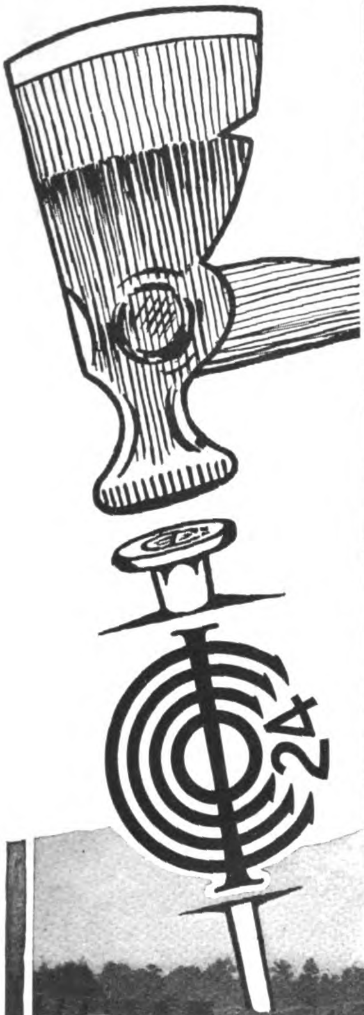
Aluminum Field Coils
Sangamo Economy Railway Meters
The Air Rectifier

District Agents
Peter Smith Heaters
Wood Fare Boxes
Bemis Boyerized Truck Specialties
Miller Trolley Shoes



METER THE ENERGY
That's What You Want To Save

We Couldn't Improve the Quality of Our Ties So We Enlarged the Dating Nail



WE wanted to do something to give a still greater assurance of tie quality to the tie buyer. Request was sent throughout the organization for suggestions which might enhance the quality of *International* Ties. The whole-hearted response indicated that the entire organization was conscientiously working to manufacture the best ties—and assuredly the best in the tie field. The quality of the tie could not be improved—so we doubled the size of the *International* dating nail.

The larger dating nail offers a greater assurance of tie quality. We want the monogram and the year of treatment to be clearly legible during the entire life of the ties.

The larger nail will make it easier for you to identify *International* ties at a future date and will constantly demonstrate to you the superiority of *International* ties.

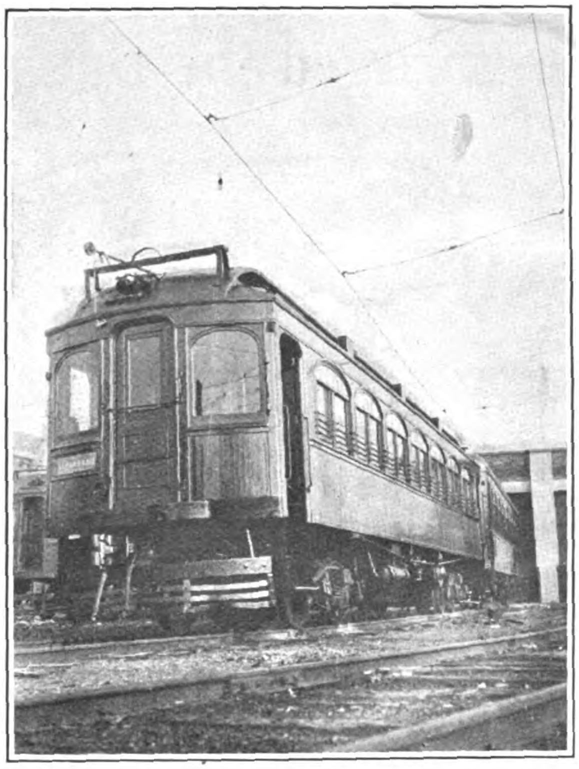
Every railroad executive who is interested in seeing that only good ties are put into his track owes it to himself and his road to investigate *International* tie service.

International Creosoting & Construction Co.
General Office—Galveston, Texas
Plants:
Texarkana, Texas Beaumont, Texas Galveston, Texas

International Products also include

Creosoted Poles
Creosoted Piling
Creosoted Lumber
Creosoted Timber
Creosoted Switch Ties
Creosoted Mine Timber
Creosoted Barge Sheathing

A half century of experience in timber preservation is at your service



Ready for the run

GALENA LUBRICANTS, backed by the experience, knowledge and personal service of experts in electric railway lubrication, have prepared this train for its day's work. The likelihood of hot boxes, dry bearings or similar troubles has been removed.

Economical Operation

The milage per pint of oil or pound of grease used will be the high average that distinguishes Galena performance. The lower co-efficient of friction in Galena lubricants will conserve power and save fuel. The perfect protection afforded to all bearings and rubbing surfaces will insure longer life to equipment and lower maintenance costs.

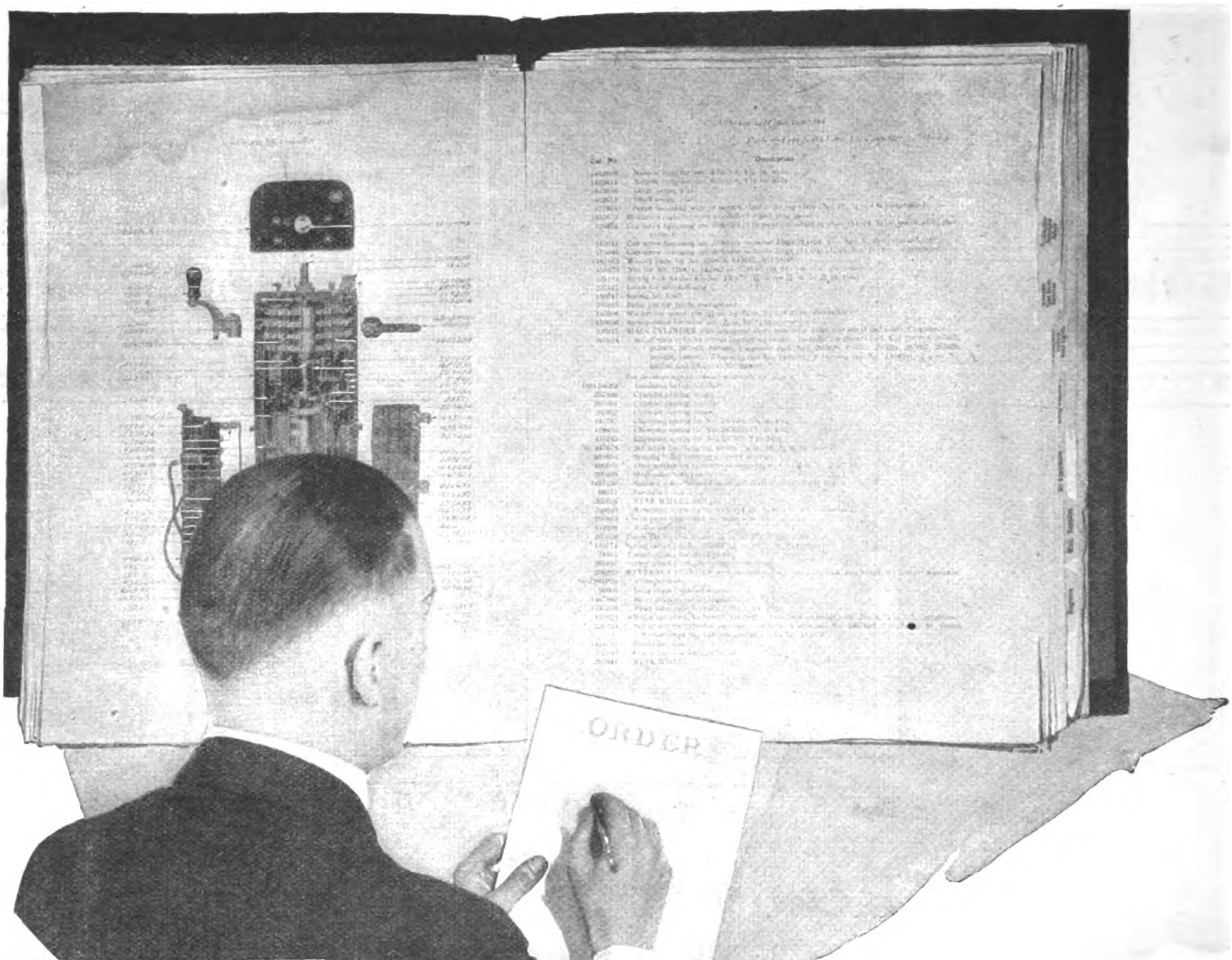
"When Galena Service Goes In—
Lubrication Troubles Go Out!"

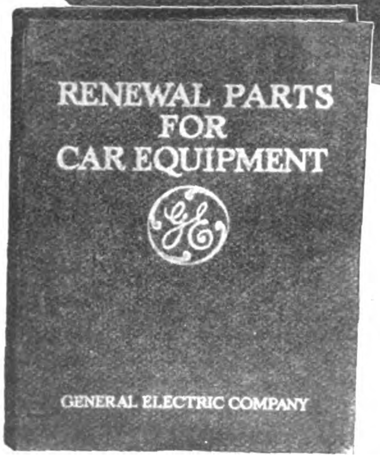
QUALITY · SERVICE · ECONOMY — GALENA OILS — G O S

Galena-Signal Oil Company

New York Franklin, Pa. Chicago
and offices in principal cities

QUALITY · SERVICE · ECONOMY — GALENA OILS — G O S





Your Guide
to Duplicate Replacement Parts

It is a fact that only the manufacturer of an equipment can furnish renewal parts for it which exactly duplicate the originals. It is also a fact that substitute parts often give inferior service and prove more costly in the end.

Therefore, it is good business to maintain good equipment with the only parts which you can be sure are equally as good—exact duplicates. To help you adhere to such a policy is the function of your G-E Renewal Parts Catalog.

In short, "Original Equipment Quality" is the only safe standard for purchasing repairs. Stick to your G-E Renewal Parts Catalog and you stick to that standard.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-344

GENERAL ELECTRIC

New York, April 12, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

Henry W. Blake and Harry L. Brown, *Editors*

Volume 63
Number 15

Rehabilitation of Property Increases Patronage

COMPARATIVE figures for the same months of this year and last year show an increase of $14,000 in revenue for the city lines of Aurora and Elgin. These lines are part of the recently rehabilitated and reorganized Aurora, Elgin & Fox River Electric Company, the work of reconstruction having been started during last year. It is safe to say that the increase in patronage was due in large part to this work. While the public may appreciate a change in policy or management, changes with which they come in direct contact in their use of the lines, such as new cars and improved running time, are what cause people to talk favorably about the company and bring increased riding. Promises and publicity and advertising cannot produce results comparable with those that come from notably improved transportation.

In the case of the Aurora, Elgin & Fox River Electric Company, the people not only reciprocated with unprecedented patronage but in addition granted unusual franchises which relieved the company of unpaid past and future paving obligations. These two manifestations on the part of the riding public serve to indicate that the inhabitants of the Fox River Valley want, and will pay for, good electric railway transportation. Faith in this is evidenced by the fact that a power company purchased the property through the bankruptcy court.

Incidentally, 98 per cent of the stockholders of the holding company live in the territory served by the railway, which also, no doubt, is an important factor in the interest shown by the public in giving the railway a fair chance to serve. So reorganization of this property will probably shortly place it on a firm earning basis.

City Officials Should Take Unto Themselves Some of the Shortcomings of Car Service

A FAVORITE sport of city officials in many places is to criticise bitterly the quantity and quality of service supplied by the local street railway. In so doing they no doubt imagine that they strike a popular chord. Perhaps they do sometimes, for every one has experienced at one time or another vexatious delays waiting for cars and tedious trips through congested traffic after boarding cars. A fact which the city officials are likely to overlook, however, is that they are often largely responsible for such shortcomings of the transportation service.

The two major causes of public displeasure are gaps in the headway and slow speed of operation. As long as the railway service is regular and fast the public will be satisfied. Of course, attractive and commodious cars are preferred, and the passengers dislike to be too closely crowded. There is, therefore, occasional clamor for better cars and more of them. But the fact is that scheduled headways are nearly always sufficiently short to handle the traffic properly if they are maintained. If delays and interruptions to service are largely eliminated criticism of the railway will die out.

Unfortunately the power to accomplish this end does not lie entirely in the hands of the railway. More delays are caused by conditions for which city officials are responsible than are caused by conditions for which the traction company is responsible. The number of delays resulting from such causes as vehicles traveling in the tracks, vehicles parked so that street cars cannot pass, vehicles becoming stalled on the track, slow or careless traffic officers, are more numerous than delays caused by mechanical or electrical failures of the railway equipment.

Moreover, railway operation is slowed down perhaps as much by the failure of public officials to abolish parking or to enforce existing parking regulations, and by the necessity to make unnecessary stops, as by passenger interchange. City officials would accomplish more by co-operation with the railway to eliminate delays and speed up the service than they do by criticism for public effect.

Express Service with Bus Locals May Increase Earning Power

IN THESE days of intensive use of facilities it is necessary to do everything possible to increase the productivity of the electric railway plant. If the cars can be speeded up the track is released that much more quickly for other cars, and the carrying capacity is increased accordingly. The greater speed naturally enhances the value of the service to the rider, so that more business can be looked for, provided, of course, the service is good in other respects.

How to get the increased speed is one of the most difficult problems with which a management has to contend. Nowadays every element seems to be working against speed, rather than for it. Only those who have tried to inaugurate modernization programs involving faster schedules know how difficult it is to get the cars moving and to keep them moving at a satisfactory rate.

Express service is one answer that is proposed frequently as a means of obtaining better schedules. Ordinarily its introduction necessitates that an entire street be given over to the express cars, as few systems have any means of passing one car around another. In a few cases local cars can be turned out at a junction to let the express cars by, but this is a wasteful procedure, and all the advantage gained by the fast car may easily be lost by the slow one that has to turn out.

A plan that obviates these difficulties and really gives fast express service is that inaugurated in Providence, R. I., using electric cars for the express line and a motor bus line paralleling them on the same street for the local traffic. This method, which was described in ELECTRIC RAILWAY JOURNAL for March 15, page 511, has worked out to the satisfaction of the company and of the public. Where the greater part of the business is carried on the express line, and the local service demanded is relatively small, the method has advantages that indicate it may be applicable to other localities. The car, which is the more economical unit to operate, has the right of way and can travel at a comparatively high speed, reducing operating costs. Stops are relatively infrequent, so that a more comfortable service can be provided and the schedule more readily adhered to.

The bus, on the other hand, can draw up to the curb to stop for passengers, so that the advantages of this factor are obtained for the short rider who otherwise might not patronize the transportation system. On account of the smaller vehicle capacity, frequent service can be given to attract business. Co-ordinated in this manner, each class of vehicle is doing its best as a part of a system.

The advantages of such a plan are so obvious that it will be well if operators will look into it closely where there is a demand for both fast express service and frequent local service. As a feature of the modernization program it certainly is worthy of attention, if nothing more. And incidentally, this bus service in Providence is paying, and so is the railway line.

Company Publications Perform a Real Service to the Industry

INDIVIDUAL managements that are sponsors for employee magazines know the benefits that accrue to them through these publications. If this were not so the number of such publications would not have grown so rapidly as it has in the past few years.

There is another side to the matter, however. It is the industry side. In this connection an important work is being done by these publications in assisting the employees to realize the part they can play in helping to build for the company and the industry the good will of the citizens. They learn that in furthering the affairs of the companies they are strengthening their own positions, for the well-being of the industry, of the company and the employees are closely linked.

The measure of merit of these company publications does not vary greatly. It would indeed be difficult for a jury of competent judges to say which, if any, is the best. It is frequently a source of wonder, however, whether managements and men fully realize the amount of work that goes into the making of these publications. They show up unobtrusively but regularly, filled with accounts of matters that are for the most part of greater interest than we realize in the lives of the men and women of the company. It is only human to take casually things that pass before one day by day. As a result, sight is often lost of the measure of merit behind performances seemingly routine, but costly in the amount of thought, effort and time put into them.

For the benefit of managements that have recently established publications of their own, it might be well to say that of the older employee magazines, those that are performing their functions best are the ones that are edited by men who have the sympathetic support and the inspirational direction of their executives. However capable the man may be to whom is intrusted the job of getting out a company publication, the work is only just begun with the hiring of the man who is to do the editing. He cannot make the magazine do what is desired of it unless the executive makes it a point to give him the background for executive decisions and to lead him in putting the spirit of the management into the publication so that it may permeate the more quickly through the entire organization.

The Paris Convention Would Interest Americans

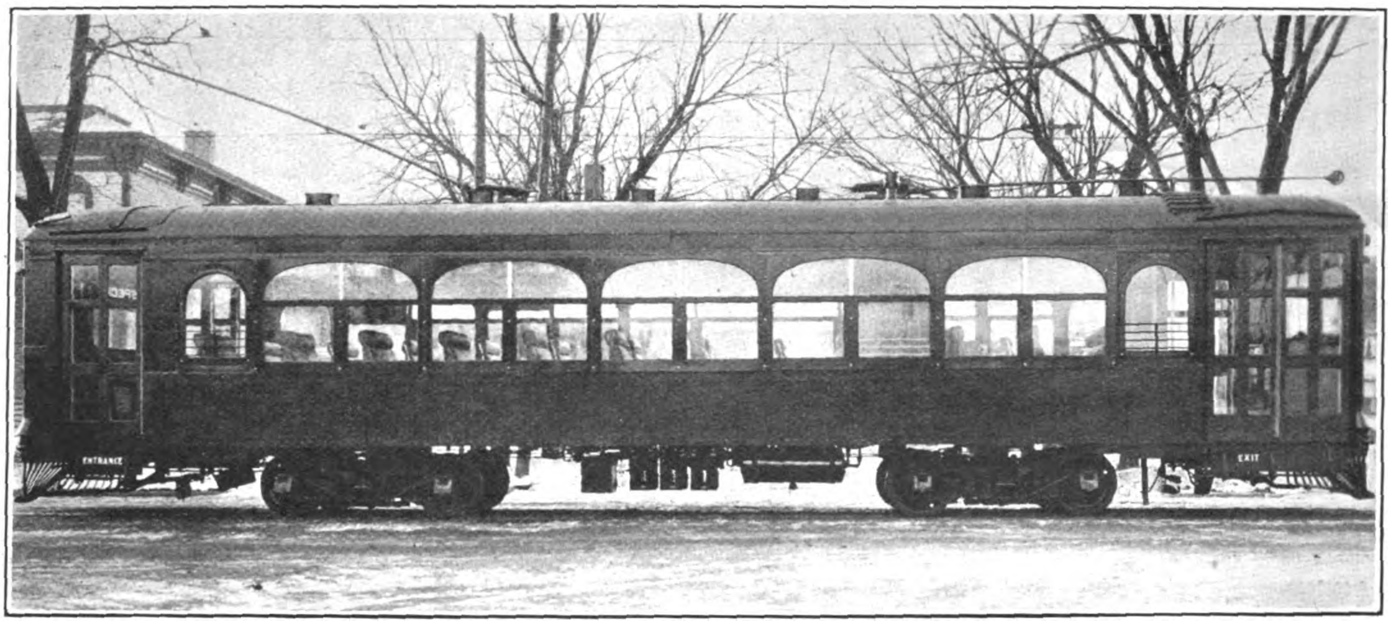
IT IS fortunate for electric railways that so much of their practice is the same all over the world. This is due largely to the fact that the industry is quite a modern one. The first commercial railways were put in operation only a little more than thirty years ago. Their engineering development has followed along much the same lines in its major aspects. Partial standardization of equipment has also come about through the fact that the larger manufacturing companies in this country are also well established in Europe and have supplied much of the apparatus used on European electric railways. The same broad economic trends have affected the earnings of European tramways in the same manner as American electric railways. So it is not surprising that many of the problems with which American electric railway companies have to contend are faced also by the European companies. No doubt much can be learned by a free exchange of information such as comes with personal conference.

The forthcoming convention of the International Electric Railway Association, to be held in Paris June 16-22, affords an opportunity for such discussion, and its program, as published in the issues of this paper for Jan. 6 and March 29, indicates that many topics of interest to railway men in this country will be considered. Letters of invitation from the international association to President Budd and Secretary Welsh of the American Association show that American railway men will be welcomed at the Paris meeting.

It might be said that the international association, officially known as Union Internationale de Tramways, de Chemins de Fer d'Intérêt Local et de Transports Publics Automobiles, has a very long and honorable record as well as name. It was established in 1885, or only three years after the American Association. It has held annual (or more recently biennial) sessions ever since, in different countries in Europe, except between 1914 and 1920. The international character of the association is shown by the fact that its executive committee includes representatives from France, Belgium, Spain, Italy, Switzerland, Holland, Denmark, Poland and Norway.

The association possesses a somewhat more official character than the association in this country, owing probably to the closer governmental connections with street and interurban electric railways in most European countries than in the United States. In consequence, at each of the conventions, delegates officially representing the different governments are in attendance.

This short explanation is given for the benefit of those American railway managers who may be in Paris in June. Railway men often take trips abroad, and if those who go this summer can arrange to include attendance at the Paris meeting, they will find it eminently worth while.

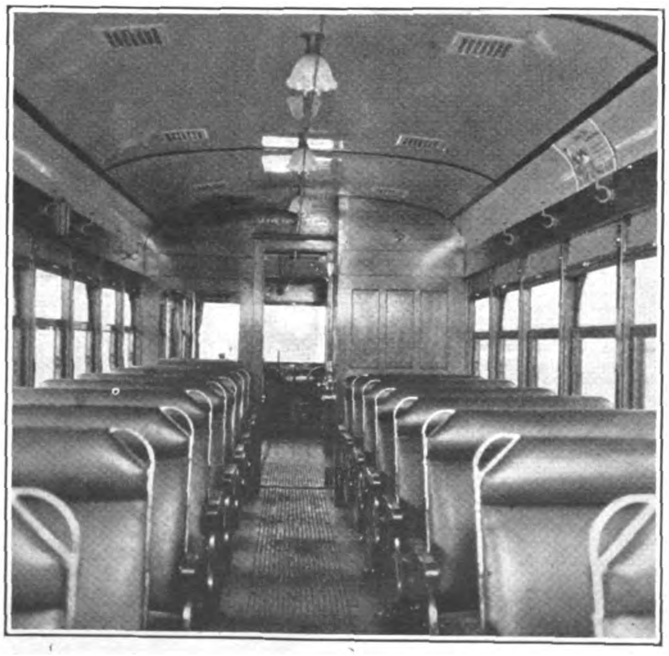


New Light-Weight, Low-Floor, One-Man, Two-Man Interurban Cars Purchased to Operate Between Aurora and Elgin

Rehabilitated Property Attracts Increased Patronage

Aurora, Elgin & Fox River Electric Company Lines Re-equipped as to Cars and Power Facilities—Part of Aurora, Elgin & Chicago Railroad Released from Receivership Through Purchase by Local Power Company—New Franchises Relieve Company of Paving Burden

EXTENSIVE rehabilitation, accomplished in five months' time, has transformed the bankrupt Aurora, Elgin & Chicago, Fox River division, into a modern electric railway property. So complete has been the change that even the name was lost during the transition, and the Aurora, Elgin & Fox River Electric Company has little else other than the track to remind it of the days of the receivership.

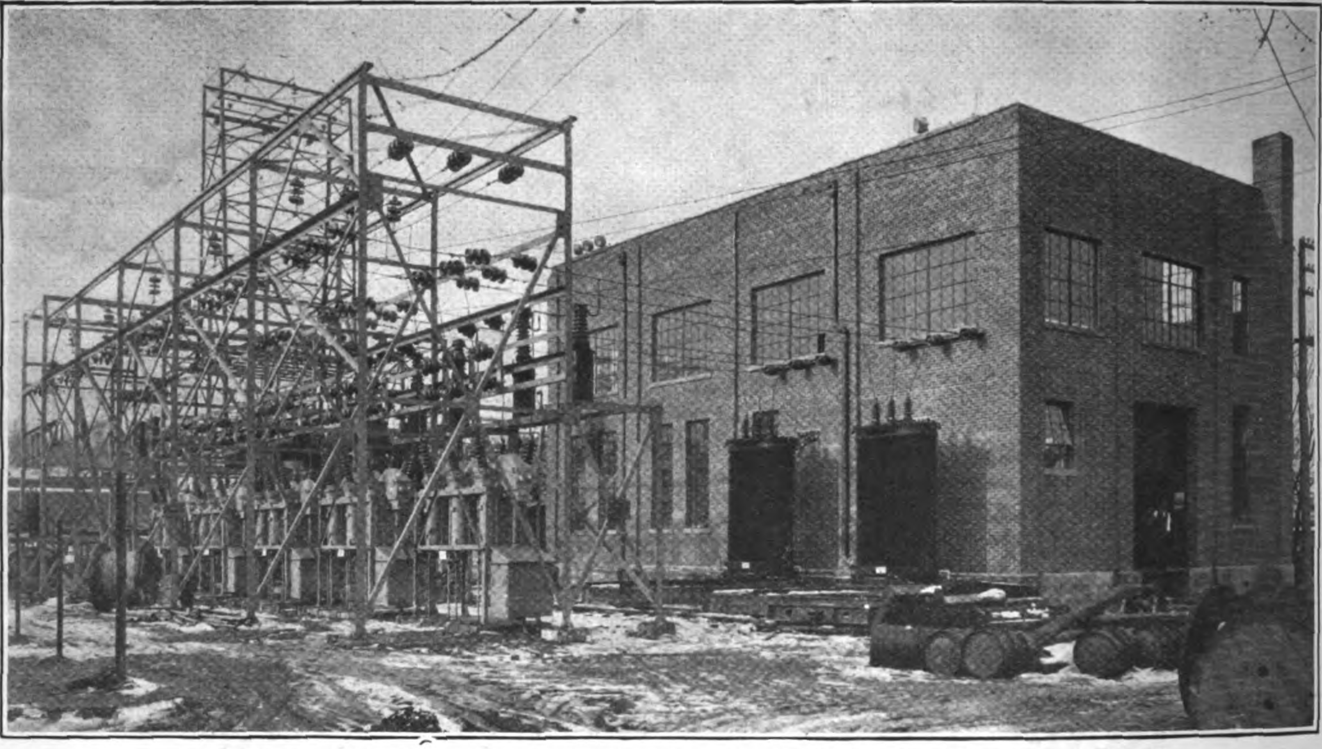


Arched Headlining, Shaded Lamps, Fabrikoid Seats in New Interurban Cars

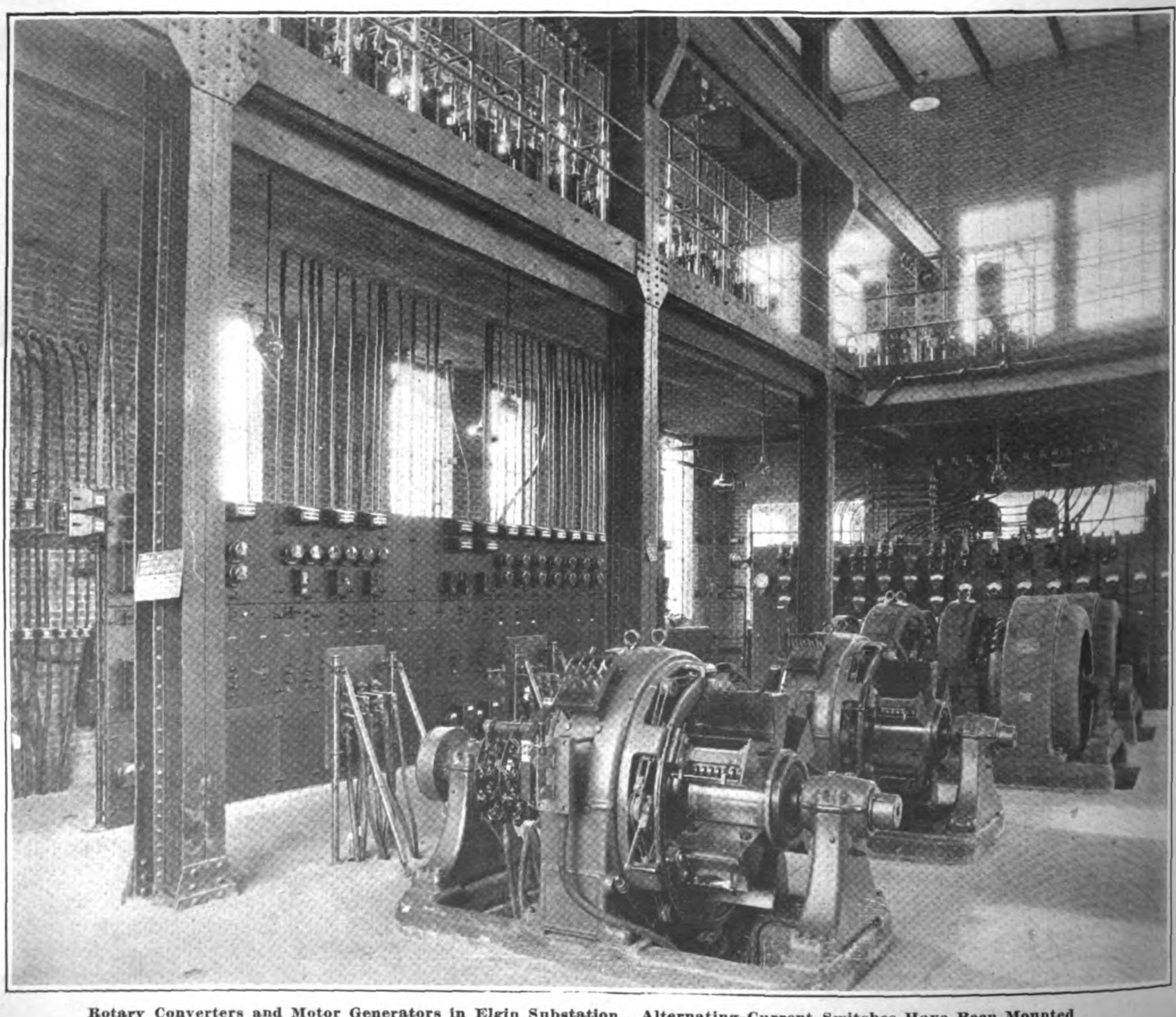
The system is now owned and controlled by the Western United Corporation, a holding company of Aurora, of which Col. I. C. Copley is president. New cars, new substations, and new management have served to sell rides to the people of Elgin and Aurora and the Fox River Valley, who are supplying an unprecedented patronage.

This property, and the third-rail division of the Aurora, Elgin & Chicago Railroad, were operated jointly, as previously, under the same receivership from Aug. 9, 1919, to March 1, 1922. On this latter date the bondholders of the Fox River division, comprising the city lines in Aurora, the city lines in Elgin, and the interurban connecting the two towns, petitioned and obtained a separate receivership. Oscar Nelson was named receiver, B. P. Alshuler was appointed attorney for the receiver, and J. F. Egolf, general manager. It was during this receivership, which terminated on Jan. 1, 1924, with the purchase of the property by the present owners, that these improvements were made.

Old equipment and unreliable operation had caused most of the dissatisfaction and misunderstanding between the public and the company. Certain obligations and promises had not been kept, with the result that the new management's first task was to re-establish confidence with the public. The trainmen were brought together at suppers and entertainments so that their co-operation might be enlisted in carrying out the new policies of the management. A voluntary reduction in fares, both on the



Outdoor Switching Apparatus and Transformers in Rear of Distribution Substation at Elgin



Rotary Converters and Motor Generators in Elgin Substation. Alternating-Current Switches Have Been Mounted on Balcony, with A.C. and D.C. Switchboards Below city lines and on the interurban line, was put into effect. The old city fare of 10 cents cash and six tokens for 50 cents was changed to 10 cents cash and seven tokens for 50 cents. A 50-cent monthly card entitling bearer to ride for 5 cents, and a school children's rate of 30 rides for 90 cents, further reduced the average rate of fare. The interurban fare was reduced by offering a 25-ride coupon book between any two towns at a 2½-cent per mile rate. A 10 per cent reduction on round-trip tickets was also inaugurated.

These various measures helped to re-establish confidence between the company and the public, and within a year favorable consideration was given to the new franchises required in several cities.

NATURE OF NEW FRANCHISES

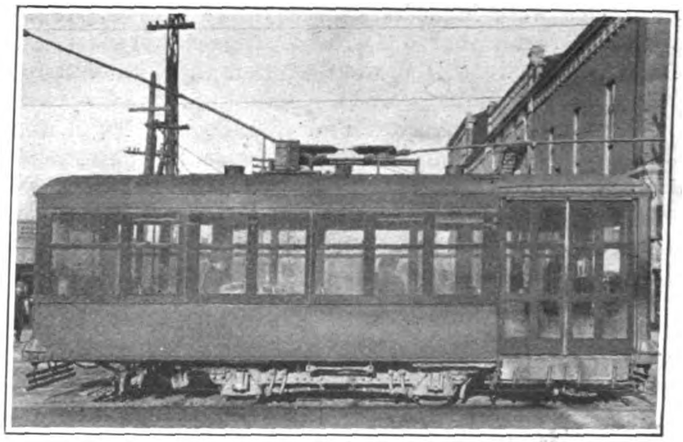
Because so many operating franchises had expired, the management found it advisable, when getting new franchises, also to revise other franchises having several years yet to run. At Aurora, a new franchise was drawn which frees the company from all future paving obligations. Similar franchises were adopted in Batavia and St. Charles, two small towns between Aurora and Elgin.

In Elgin, a different form of franchise was adopted. After meeting past paving obligations, the company is relieved of all paving and assessments for a period of five years. If at the end of this period the books of the company do not show an average of 6 per cent net return on the investment, the company is again relieved for a period of five years, and so on, throughout the duration of the 20-year franchise. If 6 per cent is made in one five-year period, assessment is to be made for the future five-year period and not for the past. In the meantime the city carries on the normal paving program.

At the time franchises were presented to the Councils or committeemen of these municipalities, Mr. Egolf explained that it was impossible to continue operations under the conditions stipulated in the old franchises. He told of the company's plan to purchase new equipment and to improve the property in general. The councilmen were thus given the opportunity of indorsing the new franchise and obtaining improved service or the alternative of rejecting it, thereby losing the advantages of electric railway transportation.

NEW SAFETY CARS

New equipment was purchased after the conditions of operation had been settled. For city operation 40 single-truck, double-door, double-end, one-man safety cars were purchased from the St. Louis Car Company. These cars weigh 18,000 lb., seat 30, including four folding seats on the rear platform. The seats are of springless rattan construction, framed in cherry. The cars are mounted on St. Louis No. 7 light-weight trucks, equipped with 26-in. wheels and two G.E. 264, 25-hp. motors controlled by K-63-M double-end control. The two doors may be opened independently or together, giving a 4-ft. opening to the platform. One of the two stanchions on the platform is equipped with a bracket for holding a Cleveland fare box. The interior of the car is finished in cherry, with white enameled Agasote headlining. The exterior of the car is painted with "traction" orange striped in black. During the winter months the side windows are covered with storm sash, made up in three sections. These are of light framed construction and cover both the upper and lower sash. They are held in position by bolts fastened to the side posts, and are further secured at the top to the drip rail. Another winter accessory is the Root snow scraper and track groover.

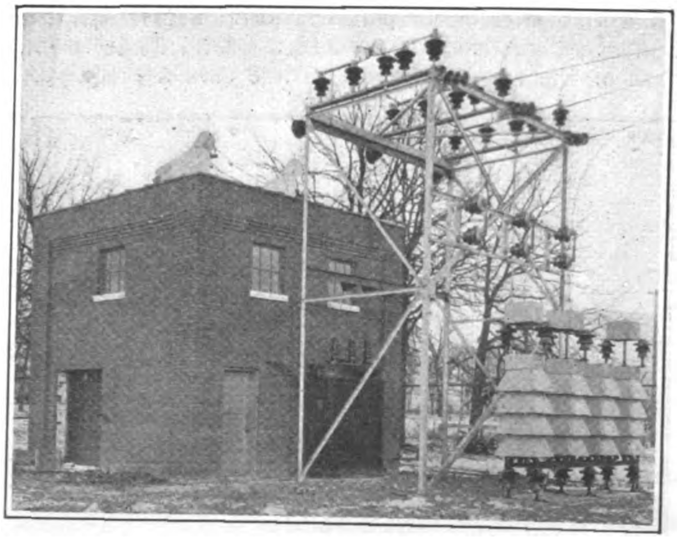


New One-Man Safety Car Purchased for City Service in Aurora and Elgin. Storm Sash Cover Both Upper and Lower Sash of Side Windows in Winter

These cars averaged 1.18 kw.-hr. per car-mile energy consumption for the first month of operation. They replaced 40,000-lb., two-man, three-step cars, which had been operated at an average of 3.2 kw.-hr. per car-mile energy consumption.

CITY OPERATION IMPROVED

Twenty-four of the new cars have been placed in service in Aurora and sixteen in Elgin. Operation of city service was radically changed with the advent of the new cars. It was possible to increase the schedule speed from 8 m.p.h. to 10.4 m.p.h., which, with a greater number of cars, made possible a 10-min. headway rather than a 20-min. headway, as had been the case with the old equipment. In Aurora and Elgin frequent headway is a necessity because of the short distance between residence and business districts which invites walking if a car is not in sight. In Elgin a change in routing was effected by placing double tracks through the downtown portion of the city. This facilitated through-routing from one side of the city to the other and made possible a 12-m.p.h. schedule speed on a 12-min. headway, where the former schedule called for a 9-m.p.h. speed on a 20-min. headway. Improvements



Type of Automatic Substation Installation Made at Batavia and at St. Charles. The Building Houses a 300-Kw. Unit in service were immediately recognized by the public, with the result that 434,470 passengers were carried in Aurora and 306,428 were carried in Elgin during the month of January, 1924. These figures, compared with 307,188 for Aurora and 246,120 for Elgin for January, 1923, indicate the increase in patronage. Comparing the same months, the revenue showed an increase in gross of $9,000 for Aurora and $5,000 for Elgin, making January, 1924, the best month the company has experienced.

New Light-Weight Interurban Cars

Shortly after the city cars were received, seven new light-weight, one-man, two-man, double-truck, interurban cars were delivered for operation on the line between Aurora and Elgin. These cars were also built by the St. Louis Car Company, and are of the straight-side, arch-roof type, mounted on 26-in. wheels and equipped with four G.E. 265, 35-hp. motors. Complete safety equipment similar to that of a safety car has been installed in order that this car may be operated by one man should the occasion demand. Each car seats 48 passengers on St. Louis Car Company's reversible interurban seats, which are full spring cushion and back type, covered with Fabrikoid. Above the upper sash, at each side post is a hat and coat hook. The interior trim is cherry. This and the white Agasote headlining give a very light, pleasing appearance. In place of a bulkhead, aluminum stanchions and railings separate the car body from the platform, allowing an unobstructed view from the seats through the front vestibule windows. A partition with swinging door divides the car into two compartments, one of which is used for smoking. A toilet has been provided in one corner of the main compartment.

Illumination of the car is accomplished by a row of 92-watt lamps with shades mounted on the headlining above the aisle. The platform areas are illuminated by five 32-watt lamps. Besides these lights, two emergency lamps are provided, operated from a 6-volt battery, for illuminating the interior of the car in case the trolley voltage fails. A thermostatically-controlled electric heater has been placed under each seat to maintain a temperature of 60 deg. F. Ventilation is taken care of by 12 St. Louis ventilators spaced six on each side of the roof.

A slight ramp in the aisle connects the floor of the body with that of the platform, and a transverse ramp from the center of the platform to the double entrance and exit doors makes the entrance level 3½ in. below that of the car body floor. These cars are equipped with safety devices and air-operated doors and step. A single folding door at the rear on the right-hand side, operated by hand, serves as an entrance when the car is operated by two men.

Streamline appearance has been obtained in the design by continuing the arch roof over the vestibules. Gothic shaped Florentine glass is used in the upper sash over each pair of windows, and an individual single sash window has been placed in each of the four panels at the corners of the car body. During the winter, storm sash made up in five sections cover both upper and lower sash, and are held in position by the drip rail at the top and by means of bolts at the belt rail and on the side posts. These are constructed of ¾-in. cherry with the upper portion shaped to conform with the design of the upper sash of the windows.

A set of two marker lights has been placed at each end of the car above the end windows on the vestibule corner posts. These serve as indicating markers on the front end of the car and as tail lights at the rear end. In normal operation each set of marker lights is illuminated by a lamp operating as part of a five in series circuit. In case of a power failure, illumination is supplied by a 6-volt lamp mounted beside the high-voltage lamp. These four low-voltage lamps, one in each marker box, with two lamps in the car interior, are operated from a 6-volt, 120-amp.-hr. storage battery located in the toilet. This battery is charged in series with the five marker lamps from the trolley voltage. A relay cuts in the 6-volt circuit automatically when the trolley voltage is off. This arrangement does away with oil lamps and lanterns for marking purposes, and at the same time insures protection in case the line voltage fails.

Nature of Interurban Operation

The interurban operation is more nearly suburban in character, because of the many adjoining small towns between Aurora and Elgin. In the 22 miles there are 50 regular stops, with 52 additional stops made on signal. During the day an hourly service is rendered, which is increased to 30 min. during the rush period. A schedule speed of 16½ m.p.h. makes it possible to complete the run in 1 hr. and 20 min.

The zone system of fare collection is employed, the distance between Aurora and Elgin being divided into 31 zones. No fare box or register is used, the conductor collecting the fare and giving a "hat check" receipt, upon which is some figure or mark designating the zone to which the passenger is entitled to ride. The checks are carried in holders mounted on each

"Selling" the Road to the Communities. One of the Interurban Parties Attended by side post and are taken up by the conductor as the car passes through the zone preceding the one to which the passenger is entitled to ride. This system met with the disapproval of the passengers at first, because of the necessity of keeping the check in sight. The conductor is placed entirely on his honor in the handling of cash fares, and the company thinks that the system has worked out as satisfactorily as the more elaborate systems involving fare boxes and registers.

POWER REQUIREMENTS

Power for the railway operation and for lighting purposes in Elgin had been obtained from the third-rail division of the Aurora, Elgin & Chicago Railroad. The contract under which the power was delivered expired on Jan. 1, 1924, and notification that this contract would not be renewed was sent to the Fox River division in November, 1922. Negotiations were immediately opened with the local power company at Aurora for the purchase of alternating-current high-voltage energy. A contract was closed for 10,000 kva. of 33,000-volt energy. As the capacity of the Aurora generating plant was such that it could not handle this load, two 7,500-kva. turbine-alternator units and the necessary boilers were purchased and mounted in an addition to the power company's plant. This more than doubled the capacity of the generating plant and involved an expenditure of more than $1,000,000, but was accomplished in the remarkably short time of five months.

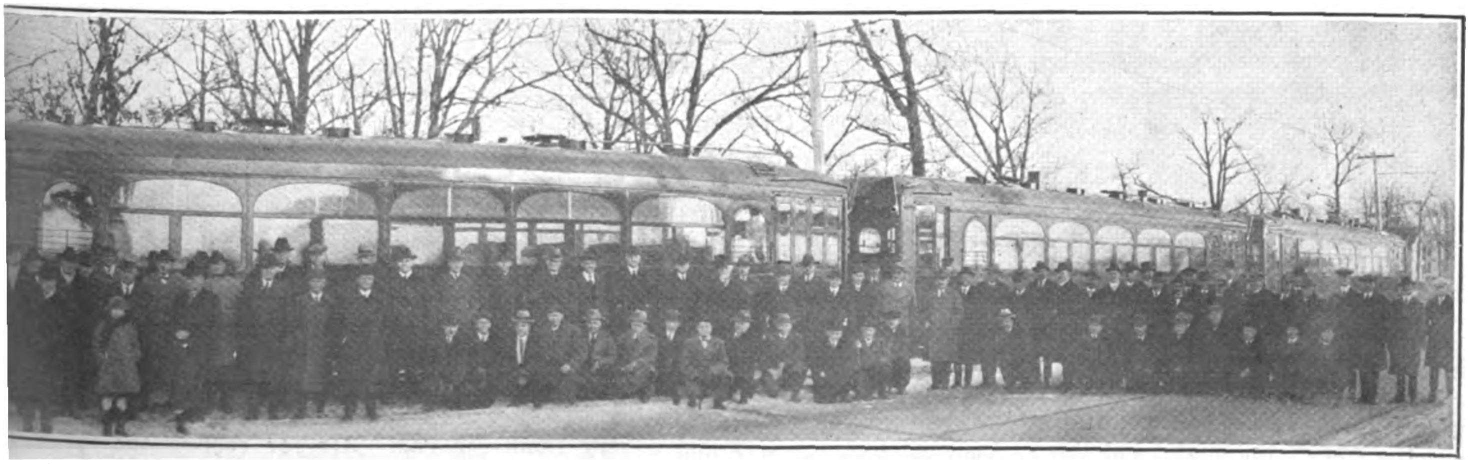
As the third-rail division had delivered the railway energy at 600 volts direct current, the Fox River division was not prepared to convert high-tension a.c. energy into 600-volt d.c. Consequently, the railway company was required to construct a three-phase high-tension pole line from the generating plant in Aurora to the distributing center in Elgin, a distance of 22 miles, with taps at St. Charles and Batavia for two d.c. substations.

At Elgin the railway company does a general lighting business, supplying the city with both d.c. and a.c. energy for light and power purposes. This energy had been purchased at the proper voltage for distribution. With the advent of the 33,000-volt line from Aurora it was necessary to construct a building to house two 500-kw. hand-operated rotary converters for the railway power requirements, two 300-kw. motor-generator sets for d.c. commercial power requirements, and the necessary regulators and switchboards for operating the station as a power and lighting distributing center. The power transformers, regulating transformers, oil switches and lightning arresters have been mounted in the yard to the rear of the building. The building installations were completed in five months, the new equipment going on the line on Dec. 28, 1923, just three days before the contract with the third rail division expired.

Trolley voltage is maintained by two 500-kw. hand-operated rotary converters mounted in the addition to the power plant at Aurora, two 500-kw. hand-operated machines in the distributing center at Elgin and two substations along the interurban line, one at St. Charles and one at Batavia. Each of these installations is of 300-kw. capacity with full automatic control. The rotary and switchboard are housed in the conventional type of brick building with ventilators on the roof and louvers in the walls near the floor level. The high-tension feed for each substation is carried on a steel framework, which supports the fuse and choke coil for each phase. This framework, the lightning arresters and transformer are mounted in the yard adjacent to the building. The transformer is connected to the line at all times and is protected by choke coils, while the line in turn is protected by a high-tension fuse in each phase. An aluminum lightning arrester is connected to each phase through a disconnect switch. These substations, the distributing center at Elgin and the power plant addition at Aurora were equipped by the General Electric Company.

FINANCED BY LOCAL MONEY

The Western United Corporation, the holding company of the Western United Gas & Electric Company, the local power company at Aurora, became interested in the railway property and purchased it through the bankruptcy court. The outstanding obligations of the railway company are: $2,500,000 of preferred stock, $2,500,000 of common stock, and $250,000 surplus replacement reserve. All of the new equipment was purchased on money obtained through the sale of receivers' certificates, which have since been refunded by bonds of the new company. There are 3,000 stockholders of the holding company; that is, the Western United Corporation, and of this number 98 per cent live in Aurora or the adjoining territory. The local bond houses and banks of Aurora handle all of the finances of the corporation. This places the railway property on a customer-ownership basis, whereby the public, through ownership of stocks and bonds, furnishes the capital for rehabilitation work and in turn derives a return on the investment in the form of dividends and service.



City Councils of All of the Municipalities Through Which the New Cars Operate

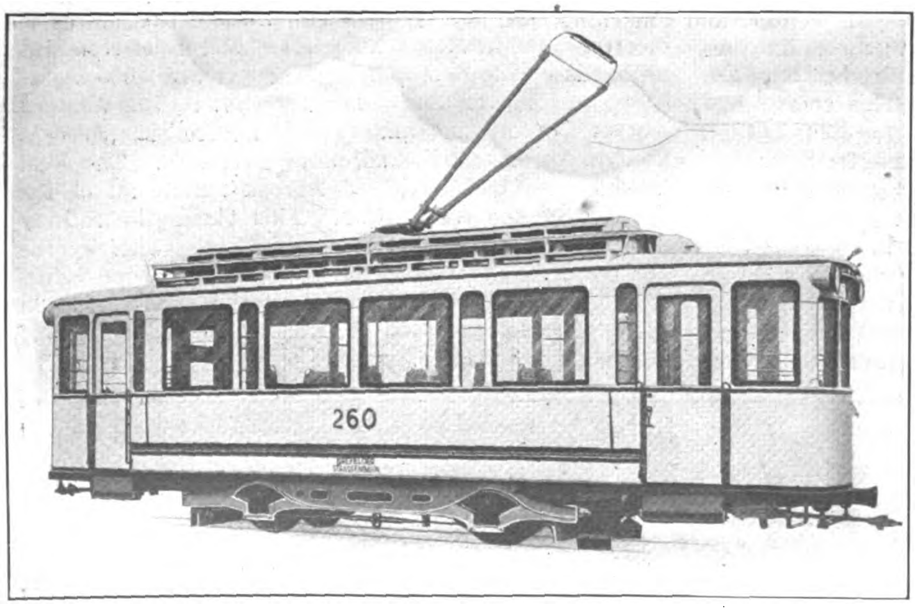
New German Cars Have Unique Features

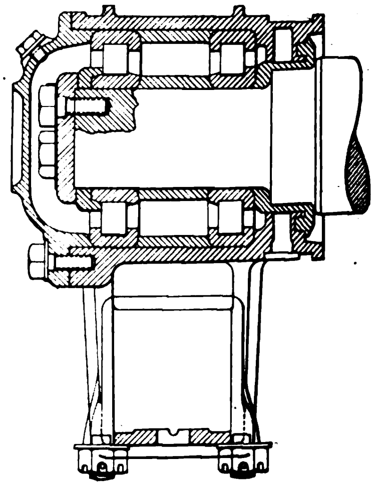
Thin Castings for Truck Side Frames—Special Leaf Springs Used—All Bearings Are Roller Type—Air for Motors Taken In at Roof—Doors on Ball Bearings

SOME interesting details of the construction of thirty new cars added to the rolling stock of the Krefeld Street Railway system (Germany) is given in *Verkehrstechnik* for Sept. 7, 1923. This is a meter gage electric railway and the cars are 34 ft. 4½ in. long, 7 ft. 1⅞ in. wide and 10 ft. 8¾ in. high. Seats are provided for twenty-two passengers, with additional room for twenty-five standing passengers. Single trucks are used which have a wheelbase of 9 ft. 9 in.

The construction of the trucks is of particular interest, as the side plates are cast of extremely thin electro-furnace steel. These plates have a strength of from 600 to 700 lb. per square inch and an elongation of 20 per cent. After the frames were cast they were annealed for several days. All supporting bosses for the brake rigging, motor suspensions and cross beams are cast in one piece with the main plates. The brake shoe heads are rigidly connected by a cross bar. This eliminates side motion and provides a uniform setting so as to utilize the full surface of the brake shoes. The diameter of the wheels is 35.1 in.

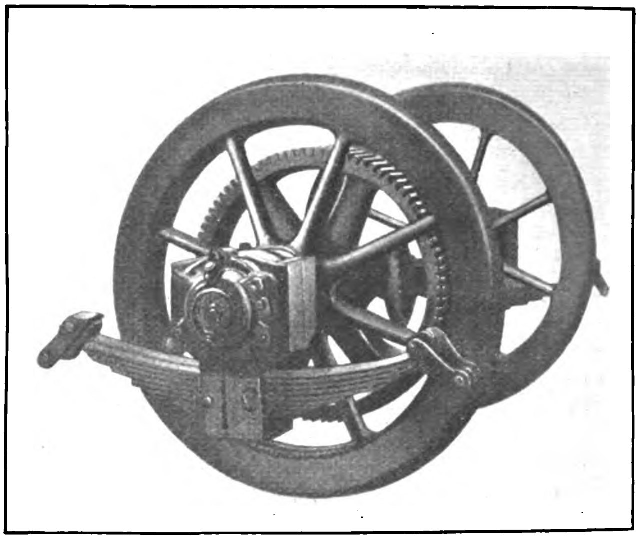
The spring suspensions for the body and the truck are also of particular interest. Leaf springs are used under the center of each axle. These are held in place by a single wide block. The springs are 31.2 in. long and 3.9 in. wide. They are composed of eight individual leaves, having a cross-section of 3.9 in. x 0.39 in. Additional leaf springs are provided for supporting the car body. These are 46.8 in. long and 9-ply. The cross-section is the same as the truck axle springs. Exceptionally thin spring leaves have been chosen after an extended investigation and are giving very good results.





At Left, New Type Car Used in Germany. The Line Drawing Shows Type of Spring Suspension Provided Between Truck Frames and Axles

All bearings are of S.K.F. precision roller type with no side play. A special arrangement of the cage rings prevents edging of the individual rollers. The outer guide rings of the rollers are held in place with a cap over the end of the shaft, and this is fastened to the shaft by three small screws. Rollers can be removed by taking off this cap, leaving the inner smooth guide ring on the shaft, thus assuring proper reassembling. Provision is made for packing the bearing with a special paste so as to make it watertight. The inner side of the bearing is equipped with a stuffing box and all bearings have sufficiently large internal pockets to hold enough lubricant for several days operation.



Roller Bearing Construction Used for Journals

These cars are intended for operation with a trailer and a draw bar is provided which will pull the truck and car body at the same time. The coupler has a hinged crosshead with an adjustable conical bolt to avoid excessive motion.

The car body construction consists of oak upon a steel skeleton. Pressed steel is used for the main and cross girders. The platforms are completely inclosed and all doors are single and 25.35 in. wide. The doors are mounted on ball bearings with adjustable ball races. A special lock permits opening of the doors from both sides. By closing two side panel doors against a permanent narrow center panel, an inclosed compartment is provided for the motorman.

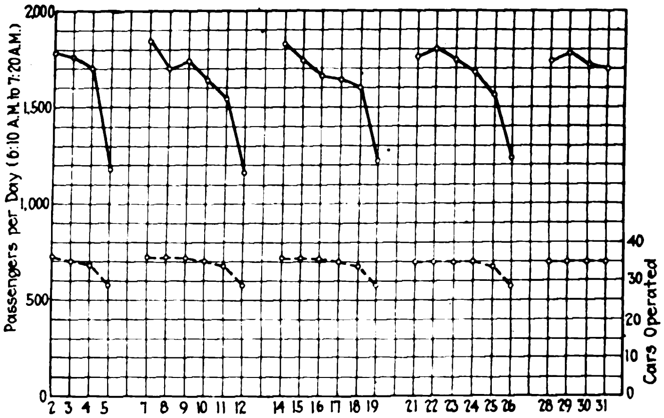
The motors are A.E.G. with commutating poles and self-ventilation. The armatures have S.K.F. roller bearings and a very small air gap. Air for cooling the motors comes from the roof of the car through a duct.

This duct has a filter to keep out grit or dust, and a tin cap covers the intake to prevent rain from entering.

The current collector is of the bow type with a carbon contact edge. The trolley pole can be raised or lowered from within the platforms. The starting resistors are mounted on the roof. Illumination of the car is from lamps arranged in three circuits, each with four lamps in series. All circuits contain automatic ballast resistors, consisting of iron wires in hydrogen gas, such as are commonly used in Europe. This causes the lamps to burn uniformly on voltages varying between 550 and 750.

Variable Mill Riding Requires Careful Checking

Early Morning Peak Serves as a Barometer for the Regulation of Schedules in New Bedford—Modern Light-Weight Cars Have Been Purchased to Assist in Handling This Traffic



Manner in Which the Morning Peak Riding Is Plotted for Comparison with Other Days in Order to Adjust Service for the Balance of the Day

THE principal industry of New Bedford, Mass., is the manufacture of cotton cloth and yarn, and traffic on the Union Street Railways varies directly according to the prosperity or depression of this industry. Riding in the morning prior to 7:30 o'clock is confined almost entirely to mill employees and constitutes the morning peak on the railway. It is subject to peculiar fluctuations and in some respects serves as a barometer of what the traffic will be throughout the day. An increase in the morning mill riding usually indicates that there will be an increase in all other riding during the day. For this reason the railway makes a very careful check of the morning rush hour daily and regulates its schedules for the remainder of the day from that.

Geographically the city of New Bedford is divided into three distinct districts, the north, center and south. Each district is covered by a uniformed railway inspector during the hours that the cars are operated, who from 6 a.m. to 7:30 a.m. week days is stationed at the point of heaviest loading in his territory. He records on a checking card the scheduled and actual time of arrival of every car and the number of passengers carried. These cards are turned in to the office of the superintendent of transportation before 8:30 o'clock the same morning.

It was formerly the practice of the Union Street Railway to check its traffic by totaling the conductor's reports of register readings on the cars. Experience showed, however, that this was a misleading figure, because the difference between the maximum load on the car at any one time and the total number of passengers carried on a trip was variable. For this reason the method was adopted of checking by actual count at the point of heaviest load.

Each morning after the inspector's checks are received in the office, the figures are copied on a large traffic sheet made especially for the purpose, and plotted. The total number of passengers carried during the morning rush hour and the number of cars operated are plotted separately for each district. Riding for that particular morning is then compared with other mornings of the same week and with riding for the cor-

10
FAIRHAVEN
FAIRHAVEN
500
500

This Type of Modern Light-Weight Car Has Speeded Up the Service in New Bedford responding day of previous weeks. This comparison provides an accurate forecast of what the railway's passenger traffic will be for the entire day. The method of plotting these figures is shown in an accompanying illustration. From this chart for one particular division it will be noted that the riding varies considerably from day to day, being consistently less in the latter part of each week, with a very decided drop on Saturday morning. Part time working of the mills is the explanation of this phenomenon. Each district has characteristics of its own, however, one being quite even throughout the week and another declining very sharply as in the case illustrated.

This system of checking makes it possible to regulate the service for the remainder of the day according to the riding during the morning rush. The time-tables are so arranged that many of the tripper runs can be allowed to remain in the carhouse without disorganizing the schedules. As soon as the inspectors' morning checks have been received by the transportation officials, it is decided what trippers will be operated that evening. A list of the tripper runs to go out in the afternoon is then posted on the bulletin board. However, as only about one-half of the evening rush-hour traffic is composed of mill employees, it is necessary to consider also some other factors when deciding how many trippers shall be run.

Modern light-weight two-man cars suitable for handling the rush-hour traffic in New Bedford have recently been purchased by the railway. A saving in weight of 6 tons per car has been accomplished, the new type weighing only 30,000 lb. They are equipped with four Westinghouse No. 508 motors per car, giving a total horsepower of 100 as compared with 160 hp. for the older cars. The wheel diameter has been reduced from 33 in. to 27 in. No change has been made in the seating capacity, and the new cars are the same length as the older type. The lower steps and wider doors, as well as the absence of the end bulkheads, make for more rapid loading and unloading. These cars have proved particularly well adapted to the service for which they were bought. At the same time their attractive apearance, resulting from pleasing lines and careful painting, created a favorable impression on the general public.

Hose Jumpers Sent to Every Fire

THE track layout in the city of Providence, R. I., is such that emergency rerouting in case of fire in the downtown business district is somewhat difficult. In order to prevent tieups of the street railway system, as far as possible, the company has established the practice of sending hose jumpers to every fire occurring along streets used by the cars. The jumpers are carried on a small railway car kept in a central location expressly for this purpose.

The city fire alarm system has been connected up with the office of the superintendent of transportation, and every alarm rings there as well as at fire headquarters. On a near-by wall is posted a list of the boxes and immediately upon the sounding of an alarm examination is made to see if the fire is located along the railway tracks. If it is, word is at once sent to the emergency car, which proceeds with the hose jumpers to the location of the alarm. These devices thus come in for frequent use and they have saved the railway many serious delays.

Public Relations in San Diego*

Railway Company Has Developed a Number of Ways to Cultivate Good Public Relations—Rendering of Special Service Is a Feature

THE San Diego Electric Railway has developed some rather unusual ways for improving the good public relations which have always existed in the city of San Diego. The company has made an effort, at various carnivals and affairs held during the year under auspices of county and city organizations, to erect education booths, where by means of maps, charts and diagrams a story of the company and its relationship to the citizens has been shown graphically. Some representative of the executive department, or sometimes a platform man, has occupied at these booths to answer questions and to deliver impromptu explanatory talks upon such subjects as visitors might indicate by their queries. The relationship established through these contacts has been continued by encouraging the participation of the employees of the company in civic affairs and in various fraternal and social organizations. Particularly has membership in district improvement clubs and in church and social groups been encouraged.

At the end of one of the company's lines it has maintained at its own expense one of the most beautiful flower gardens in southern California. This is at Mission Cliff Gardens, as the reservation is called. It is the site of most of the reunions and state picnics which are a part of California life, and is kept attractive at all times by an ample force of gardeners and caretakers. No admission is charged. The company's interest in similar undertakings conducted under public or semipublic auspices is shown by its support of a zoological society, organized during the past year. Free service has also frequently been given for outings and picnics by orphanages. A girls' club, made up of young women employees of the company, has been encouraged by the company to contribute its social hours, money and material to the various welfare organizations of the city.

Not the least of the accomplishments in this direction has been the co-operation which the company has given to the local office of the United States Veterans' Bureau, rehabilitating men disabled in the war. A number of these veterans are in what is known as "Placement Training," that is, they are learning with the company under government supervision the trades and occupations which will fit them again to be self-supporting. If possible the company employs the graduates.

The company carries on its payroll a man who is stationed every day in the Plaza, a park in the heart of the city, which is a favorite starting point for tourists, and it is his business to answer all questions and give all directions requested pertaining to local points of interest. This information clerk has answered as many as 7,000 questions in a single day, and on an average Sunday morning he directs some 250 to 300 persons to churches.

Finally, the company has made a special effort to serve any particular transportation need which may exist in the community. Thus, it has established bus feeder lines to districts not adequately served by the trolley line, and it has contracted with the school board to give a special service to the high school.

---

*This article is based on material included in the brief submitted to the Charles A. Coffin Prize Committee of the American Electric Railway Association by the company named.

Toronto's Two and a Half Years of M. O.

Operating Success to Date May Be Attributed Largely to the Integrity and Progressiveness of the Management, Rather than to Municipal Ownership —The Property Has Been Completely Rehabilitated and the Principal Lines Rerouted—Many Other Improvements Made

By "Observer"

ENOUGH time has elapsed since the city took over the lines of the Toronto Railway Company on Sept. 1, 1921, that some idea can be obtained of the progress made under municipal operation. Unlike some other municipal properties, every effort has been made to give real service and provide the city with a good and modern transportation system.

Canada is more given to municipal ownership than the United States. Several of the smaller electric railway properties are owned by the municipalities. Then, too, one cannot overlook the great "Hydro" system which supplies the greater part of Ontario with electrical energy from Niagara at reasonable rates. The way this project has taken with the public is noticeable in the housefurnishing stores, where electric ranges are on display. They are advertised in the newspapers as commonly as gas ranges are on this part of the continent. The Canadian National Railways is another example of government ownership on a scale far larger than anything attempted in the United States.

Toronto is the largest city in the Province of Ontario, and is running a close second for the greatest population in all Canada, with about 550,000 inhabitants. Its growth has been quite rapid, and unless some unforeseen condition halts its progress, it will not be surprising if it passes Montreal within the next few years. While there is considerable manufacturing, the city is more of a commercial center, the distribution of merchandise being a leading activity. This is inevitable, as the city is situated on the northern shore of Lake Ontario, with a fine natural harbor formed by an island directly off shore. Rail transportation is furnished by the Canadian National Railways and the Canadian Pacific, the two great railway systems of the Dominion.

Since the railways are located along the waterfront, the business section of the city naturally began its development close to the harbor. Yonge Street, the principal thoroughfare, runs back directly northward and at right angles to the lake front. Its intersection with King Street, a few blocks away, was formerly the business center, but in recent years there has been a trend uptown, so that now the retail district is closer to Queen Street, which is four blocks further back. Thus the stores are concentrated in a relatively small area, a condition that tends toward serious congestion similar to that in the average city of the United States.

For a long time previous to municipal operation the street railway system was on the down grade. The tracks and the cars were badly in need of repair, and the facilities for housing the cars and for doing the repair work became more inadequate as time went on. This condition was in part due to the determination of the city to obtain control of the property and to operate it as a municipal enterprise, which kept the owners from investing new capital. The story of the proceedings has been recounted in detail in this paper. It culminated in the purchase of the property by the city in 1921, the price being settled by a board of arbitration after a long drawn out series of hearings.

One factor that has contributed in no small degree to the success of the enterprise is the non-political character of its control. This has been divorced entirely from the local political fields, being in the hands of a non-partisan commission of three men chosen on the basis of their business ability. In their turn, they have adopted the same method in the selection of the active management. H. H. Couzens, who has been general manager from the beginning of municipal operation in Toronto, had already made an enviable record as an executive when he took charge of the system. That his administration was successful is attested to by his recent selection for the vice-presidency of the subsidiary companies of the Brazilian Traction, Light & Power Company, a private enterprise. The esteem in which Mr. Couzens is held locally is attested to by the commendatory editorial comment in all the Toronto papers on the announcement of his new connection, no matter what their political complexion.

The same policy of non-partisan control has been continued with the promotion of D. W. Harvey, who has made an excellent record as assistant manager under Mr. Couzens, and who will succeed him.

REHABILITATION OF THE PROPERTY WAS A REAL PROBLEM

A big problem of rehabilitation faced these men when they took control of the property. In addition to the Toronto Railway, there were several so-called civic lines that had been built by the city to serve outlying districts in which the old company had failed to make extensions. These had to be tied in and coordinated with the rest of the system. This situation required an extensive program of track reconstruction, in which all but about 50 miles was rebuilt. Then the portions of the radial lines located within the city limits were added, so that today the commission operates all the street railway track in the city.

The condition of the property when it was taken over ranged from 55 to 90 per cent, according to the engineers who testified at the arbitration hearings, an average figure being about 74 per cent. This indicates a standard much lower than that found on the average American property in fair operating condition, which will run about 85 per cent.

Quantity production methods had to be worked out for the construction of the track, but the proposition was handled so well that all of the work was done during the past two seasons and this year's construction program will be quite small, the track all being in good condition. The construction methods used were described in this paper, issue of April 1, 1922.

The rolling stock was all of it old, the greater portion being of the types familiar a generation ago. Trailer trains of single-truck cars were familiar sights in the rush hours right up to the time the city took hold. Within two years rolling stock was purchased to meet all the requirements, except for a few of the lighter lines where it was felt that the older cars could be remodeled to advantage. This work has now been done, so that all of the cars in service are either new or have been thoroughly overhauled within the past two years. On all the heavy lines trains of pay-as-you-pass motor cars and center entrance trailers are in use. Improvements of many kinds have been incorporated in these cars, the three-door design of the trailer being unique. These cars were described in detail in ELECTRIC RAILWAY JOURNAL for June 23, 1923.

The best of the old cars have been overhauled and are in service on lines where the duty is not so severe. Thirteen of them have been re-equipped for one-man operation.

The carhouses were inadequate to care for the old rolling stock, and entirely unsuitable for the new large cars. This necessitated the construction of a series of carhouses and storage yards of modern design.

Proper facilities for overhauling cars were almost entirely lacking when the commission began its work. A new shop, with a capacity for handling fully twice the number of cars in active service, has been placed in service within the past month. This has all the latest facilities for rapid handling of equipment and economical operations. A complete description will be published in an early issue of this paper.

That the commission has had the funds with which to make these radical improvements is due largely to the foresight displayed at the outset in fixing a rate of fare that was sufficient to provide enough revenue to leave a surplus after paying normal operating expenses. The fare had been 5 cents for years. Even before the beginning of city operation, the announcement was made that the fare under the new control would be 7 cents cash, or four tickets for 25 cents. Children's fares were raised proportionately.

The increase in fares caused considerable adverse criticism from those who had expected some form of magic from municipal operation, but they have long since forgotten their displeasure in view of the improved service rendered.

Another move made at the beginning was the cancellation of licenses of all competing buses. These had given the old company some trouble, and had caused a loss of revenue. This did not have to be faced by the commission, making it somewhat easier to handle the situation.

The result of these arrangements and improvements has been that the system is now able to give real service to the city. The increase in rate of fare did not affect all the riders, as the civic lines, which were taken over by the commission, formerly had collected an additional fare of 2 cents above that charged by the company. Through service was given on these lines, thus making them an integral part of the system.

It soon was found that the routes as formerly laid out did not serve the city at all well. There was too much duplication of service, and the congestion in the heart of the city was bad. A few minor changes were made as quickly as possible, but in July, 1923, the principal routes were changed quite radically. There was a material saving effected by the rerouting, but the major part of it was put back into service. The service given in the non-rush seems to be more than adequate, while in the rush hours the capacity furnished is apparently ample to handle the loads without undue crowding. If anything, the service could stand a reduction. Then, too, there is practically no short-routing of cars except on a few lines in the rush hours. Many cars go through to the outer terminals with light loads, and the routes are so long that there is no chance for cars to make second trips in the rush.

BUSES AND TROLLEY BUSES ARE ALSO USED

Advantage has been taken of all available means of transportation. Both gas buses and trolley buses are in use on certain of the outlying lines, where it has not been felt that rail service would be justified at present. These vehicles are being operated strictly as adjuncts to the trolley cars, and it is stated that the rails will be extended in each case if the business warrants. The buses used are of the most modern types, and they are maintained on the same standards as have been adopted for the cars.

The organization is much the same as that of a private company. There is no difference in the attitude of the department heads toward their work. They appear as anxious to keep down expenditures and obtain maximum results as men in similar positions anywhere. In fact, they seem to take pride in the fact that they can do things better than their competitors. All positions are under the control of the general manager, which in itself indicates the desire to keep political appointees out of office.

The platform men seem well trained and courteous. They appear to be working for the interests of their employers as much as in any private corporation. They are unionized, but up to the present time there has been no conflict with the management. They have requested vacations with pay similar to those of monthly employees, but have accepted the statement that such concessions cannot be granted to men working by the hour and being paid for overtime.

A good point noticed was the method of determining what children should pay full fare. In each car a mark is made on a stanchion or some other vertical part 51 in. from the floor. If the child is under this height he pays half fare, if above, full fare. This eliminates disputes and makes it unnecessary for parents or children to resort to perjury.

A factor which is the source of serious concern to the management is the competition of private automobiles. The past winter was very mild until February, and many people kept their machines in service, with the result that the receipts were slightly lower than for the previous year. In February, however, the weather was quite bad and there was a heavy fall of snow, with the result that the automobiles remained in their garages and the people rode the cars, producing an increase in business over last year. Even though it is a municipal enterprise, it must face adverse conditions, just as the private company.

Altogether, the public seems well pleased with the venture in municipal ownership. Of course there is the contrast with what had gone before, so that the service has been a distinct improvement. It ranks as good service, however, when measured by the standard of any American city, and is far better than some of the private operations one might mention.

Unified Traffic Control Tried in Los Angeles

Movement of Motor Vehicles in the Congested Area Has Been Facilitated, but Railway Operation Has Been Slowed Down Considerably

THE Los Angeles Railway has found the unified traffic control system installed three years ago a handicap to its operation. Comments on this subject were made by G. B. Anderson, manager of transportation Los Angeles Railway, at the Midyear Meeting of the American Electric Railway Association at St. Louis March 4, as noted on page 372 of the ELECTRIC RAILWAY JOURNAL for March 8, 1924. In the opinion of the railway there is no automatic signal that can handle traffic as expeditiously as a manually operated signal when the latter is in charge of a competent man.

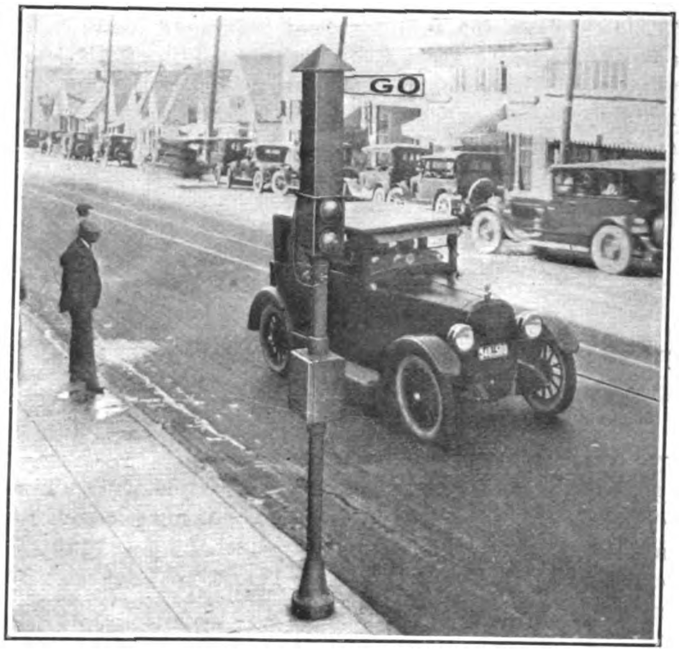
Prior to 1921 the handling of traffic in Los Angeles was accomplished by stationing a patrolman at each important street intersection. Increasing congestion eventually demonstrated the inadequacy of this system and indicated a need for some sort of control that would permit faster traffic movement. During that year a new system was installed, consisting of signals at the busiest intersections in the city, all controlled from a single central station.

The timing station is located in the approximate center of the congested area of the city. From there five main circuits connect with signals at 31 intersections. At each corner there are four signal standards, equipped with "go" and "stop" arms, as shown in the accompanying illustration. Under the normal method of operation traffic proceeds when the "go" arms are displayed at diagonally opposite corners. The "stop" arms at these corners are then folded out of sight. Simultaneously the "stop" arms are displayed at the other two corners, while the "go" arms there are folded up. In case it is necessary to change the method of operation at any particular intersection the four signals may be operated manually from one of them, which is known as the master control unit for that corner.

Below the semaphore arms there are red and green lights. The former operates in conjunction with the "stop" arm and the latter with the "go" arm. During the daytime the lights are switched off. At the top of the signal standard under the hood is located an electric bell which rings for three seconds with every movement of the semaphore arms. The bell, however, is operated from the central station independently of the arms and can be used also to give special signals as in case of an alarm of fire.

When the system is operating automatically the direction of traffic flow is alternated at consecutive intersections, the theory being that this alternation makes possible a continuous movement over several blocks in a single direction, the signals changing to "go" just as the moving vehicles reach the corner. This is thought by the advocates of the system to be a better arrangement than to have the intersections controlled by traffic officers who may not co-ordinate their signals, thus allowing more traffic to flow into some blocks than is allowed to flow out again at the next intersection. It is said to be superior also to a traffic control system whereby all traffic is simultaneously halted over a large area to permit the movement of cross-traffic. The claim has been made that it is possible for an automobile to pass from one end of the congested district in Los Angeles through to the other end without being once delayed by cross-traffic. Careful observation, however, does not confirm this contention.

One of the difficulties with the present arrangement is that the north and south interval of 45 sec. is too long in comparison to the east and west interval of 35 sec. Observation has shown that there is often from 8 to 20 sec. when the signals are clear for north and south movement and no traffic to move. Meanwhile east and west bound traffic is held up. Traffic officers make little attempt to stop the flow of traffic over the intersections until the change of signals. As a consequence signals are found reading "go" in one direction while the traffic is still moving on an intersecting street.



A Signal Standard of This Type Is Used at Each of the Four Corners of Every Street Intersection in the Congested District of Los Angeles

The railway has found that there is a temptation for motormen to try to beat the traffic signal and start their cars too soon. When the signal is clear there is a natural desire to take advantage of it and the cars sometimes fail to wait until all passengers have boarded. Also, drivers of motor vehicles often operate at excessive speed in their desire to beat the signal at a crossing. It is thought that a majority of the automobile accidents in the congested districts are attributable to this cause.

Purchasing Energy Saves $15,000 a Year

ARRANGEMENTS have recently been completed by the Hartford & Springfield Street Railway, Warehouse Point, Conn., for the purchase of electrical energy from the Northern Connecticut Light & Power Company, Thompsonville, Conn. The railway's steam power plant at Warehouse Point has been shut down and direct current for car operation is obtained through a 1,000-kw. rotary converter substation.

The railway company has been in the hands of a receiver for some time, so that the agreement made with the approval of the court is for one year only and thereafter from year to year until terminated by either party. The introduction of central station energy into this situation indicates a substantial saving to the transportation company, the rate for energy being on a sliding scale to compensate for variation in power demands.

Two 500-kw. rotary converters with the necessary transformer equipment have been installed by the railway to supply the trolley service, energy being purchased at 13,200 volts. The converter and transformer installation cost about $25,000. The railway company generated 2,392,000 kw.-hr. in 1922 at a total cost of $69,950 (the principal items were fuel, $46,210, and power station labor, $14,262). Allowing 15 per cent loss in the conversion would require the purchase of 2,673,410 kw.-hr. At the contract price, including 15 per cent charges on a total investment of $30,000 on the part of the railway to provide for the supply and $1,000 a year for maintenance, the same amount of energy purchased from the Northern Connecticut Company would have cost $54,948, or a saving of approximately $15,000 per year to the railway on the 1922 consumption basis—50 per cent on the cost of the equipment installed to permit the purchase of energy.

Daily Statement of Earnings and Expenses

Eastern Massachusetts Street Railway Finds It Useful in Making Service Adjustments—Also Keeps Census of Industrial Population

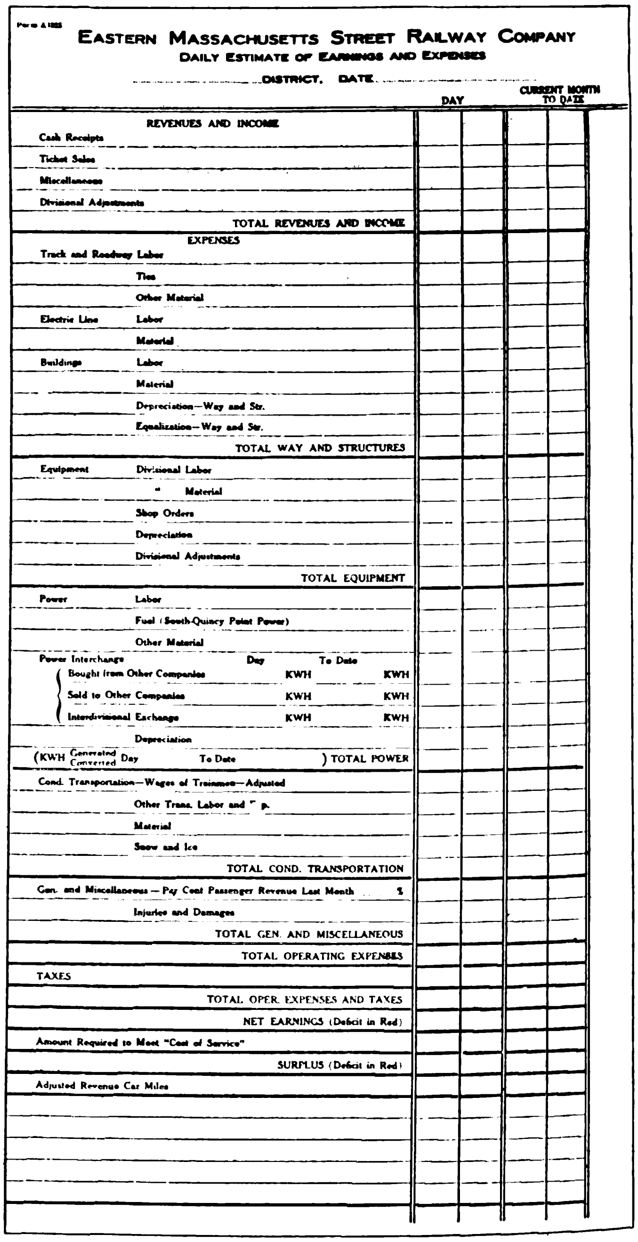
FOR about four years the Eastern Massachusetts Street Railway has followed the practice of requiring each of its fifteen local managers to compile a daily statement of earnings and expenses. The advantages of such a statement over the monthly statement are apparent, especially as the monthly statement usually is not available earlier than the 10th of the month following that for which it is compiled. With the daily statement, tendencies in both earnings and expenses can be very quickly detected, and the plan makes possible very prompt action in controlling service and other expenses.

Possibly closer attention to changes in the demand for transportation is necessary in very highly developed industrial territory, such as that served by the Eastern Massachusetts Street Railway, than in a community with more diversified interests. Slight changes in the cost of raw materials or in the demand for finished products affect directly the number of employees required in the many large cotton mills, woolen mills and shoe factories in the territory of the Eastern Massachusetts Street Railway.

The form upon which this daily statement is compiled is reproduced herewith. The reports from each division are assembled by one of the assistants in the central office. He keeps in close touch with all work being done and with the records as they come in from the divisions and thus can watch the margin between receipts and expenses as well as quickly detect any abnormal or unwarranted tendencies in either gross or net. Any such tendency is investigated and called to the attention of the proper officials. Summaries of the major items are prepared every seven days.

This plan makes available for the management reasonably accurate figures on the second day after the day to which they apply. While some estimates necessarily have to be made, it has been found that the figures are so accurate that the totals at the end of the month will not vary to any important extent from the corresponding actual figures in the regular monthly report. In practice, a few of the daily expense figures are the daily average of the monthly figure, so that it is necessary to calculate only the variable items.

While this daily statement has proved most useful for the purpose intended, it is not the only means used for determining promptly possible variations in the demand for transportation. Another and very effective way is by keeping an up-to-date "census" of the employees in the principal factories served. The basis for this census is a count which was taken three or four years ago, showing for each district the distribution of industrial workers and their demands for transportation. Since then, the railway company has arranged with each large employer of labor in the district to appoint some one in his organization to inform the railway promptly of any changes in the factory force which will affect transportation schedules. The interest of the employer lies in the fact that his employees in this way are insured of adequate car service when the working forces are increased.



Form A 1225

EASTERN MASSACHUSETTS STREET RAILWAY COMPANY
DAILY ESTIMATE OF EARNINGS AND EXPENSES

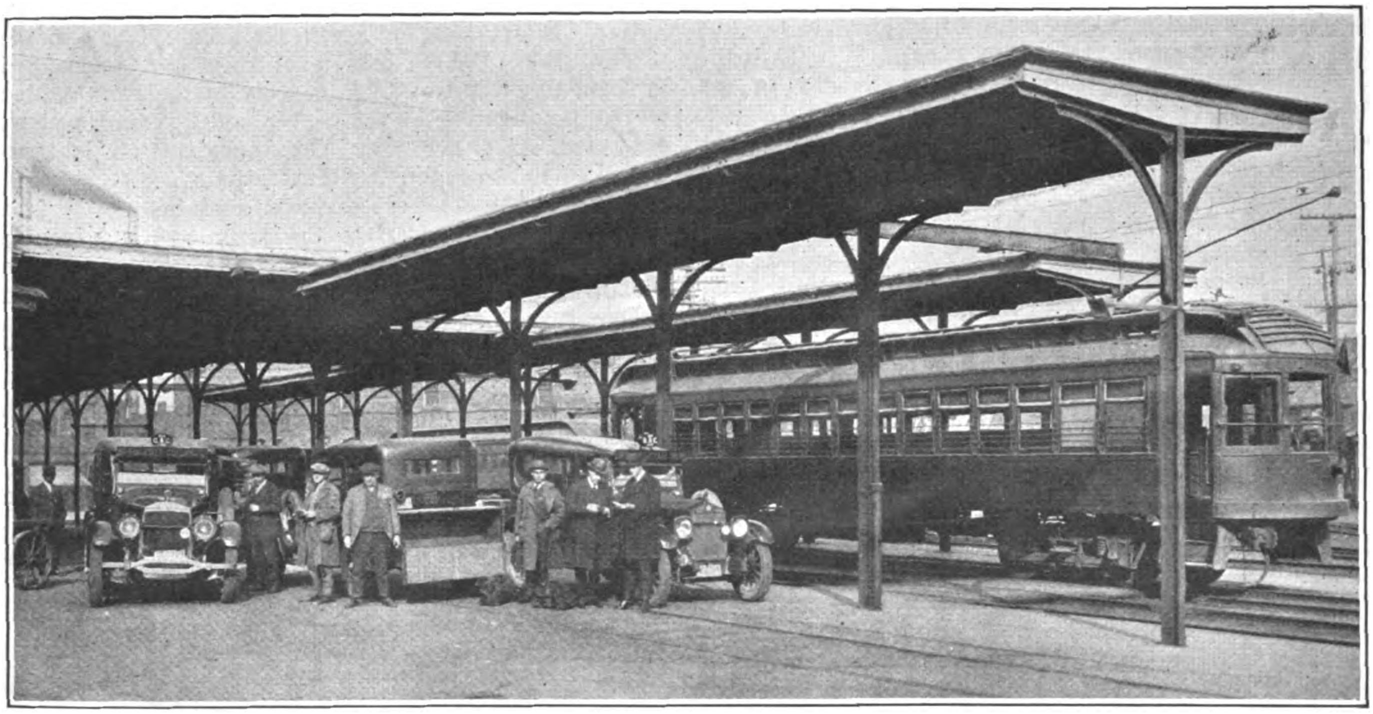
.................DISTRICT. DATE.................

		DAY		CURRENT MONTH TO DATE	
REVENUES AND INCOME					
Cash Receipts					
Ticket Sales					
Miscellaneous					
Divisional Adjustments					
	TOTAL REVENUES AND INCOME				
EXPENSES					
Track and Roadway Labor					
	Ties				
	Other Material				
Electric Line	Labor				
	Material				
Buildings	Labor				
	Material				
	Depreciation—Way and Str.				
	Equalization—Way and Str.				
	TOTAL WAY AND STRUCTURES				
Equipment	Divisional Labor				
	" Material				
	Shop Orders				
	Depreciation				
	Divisional Adjustments				
	TOTAL EQUIPMENT				
Power	Labor				
	Fuel (South-Quincy Point Power)				
	Other Material				
Power Interchange	Day To Date				
Bought from Other Companies	KWH KWH				
Sold to Other Companies	KWH KWH				
Interdivisional Exchange	KWH KWH				
	Depreciation				
(KWH Generated Converted Day To Date	) TOTAL POWER				
Cond. Transportation—Wages of Trainmen—Adjusted					
	Other Trans. Labor and " p.				
	Material				
	Snow and Ice				
	TOTAL COND. TRANSPORTATION				
Gen. and Miscellaneous — Per Cent Passenger Revenue Last Month %					
	Injuries and Damages				
	TOTAL GEN. AND MISCELLANEOUS				
	TOTAL OPERATING EXPENSES				
TAXES					
	TOTAL OPER. EXPENSES AND TAXES				
	NET EARNINGS (Deficit in Red)				
Amount Required to Meet "Cost of Service"					
	SURPLUS (Deficit in Red)				
Adjusted Revenue Car Miles					

Form Used for Daily Statement on Earnings and Expenses, Eastern Massachusetts Street Railway

Railway Operates Passenger Automobiles for Intercity Service

Indiana, Columbus & Eastern Traction Company Uses Seven-Passenger Touring Cars Under Competitive Conditions—Cost of Operation Is Comparatively Low—Rules Insure Careful Operation—Regular Maintenance Reduces Road Failures



Buses and Cars, Both Operated by the Railway, Use the Same Terminal

BUS service in competition with their own interurban lines as well as with other buses has been operated for the past year by the Indiana, Columbus & Eastern Traction Company, Springfield, Ohio, and the Columbus, Newark & Zanesville Electric Railway. Twenty-six Studebaker seven-passenger touring cars are operated on an hourly schedule between Columbus and Dayton and between Columbus and Zanesville. Bus schedules are arranged so that they are staggered with the interurban cars to give the equivalent of half-hour service.

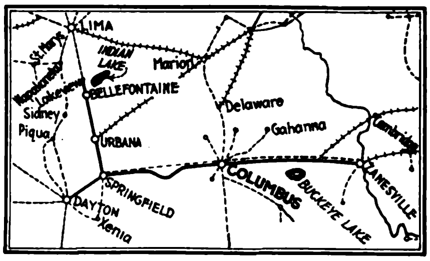
In order to gain the advantages accruing to those who were bona-fide bus operators when the revised Ohio motor bus law went into effect, these railways were forced to put an extended bus system into operation hurriedly. They entered the bus business to control the routes paralleling their interurban lines and also because they believed that there was a real public demand for this type of transportation and that it should be furnished by the existing companies. The entire plan was inaugurated between April 8 and April 12, 1923. Considerable publicity has been given the new operation to assure the traveling public that the bus service will be continued by the electric railway after competition has been eliminated.

In studying the effect of private automobiles on interurban earnings, the management found that more serious inroads were made on local business than on through business. The conclusion was reached that the passenger automobile had also created a certain demand for motor transportation that really represented new business. It was believed that a certain proportion of intercity riding in private passenger cars could be induced to utilize a properly operated bus system. This would thus represent new traffic that could not be induced to use the interurban railway line. Providing competition was eliminated, such business could be handled profitably by bus. Moreover, it was felt that the use of comparatively light, cheap passenger cars would give low investment and low operating costs and would reduce the losses incurred during the period of competition.

The bus routes parallel practically all the divisions of the electric railways with the exception of sections between Dayton and Union City, Lakeview and Lima and Newark and Zanesville. Twenty-one vehicles are required to operate the hourly schedules, although twenty-six were purchased to provide a sufficient number of extras. They are seven-passenger Studebaker "Big Six" touring models, equipped with winter tops.

At first, to determine the possibilities of the new service, the buses were operated from 4 a.m. to 11 p.m. The fare is on the basis of 3 cents a mile and with a vehicle seating seven paid passengers the maximum possible revenue would be 21 cents per bus-mile. Under the competitive conditions existing, however, only 8 cents per bus-mile was actually obtained.

A schedule speed of about 30 m.p.h. is maintained.



Railway Bus Routes Between Dayton and Zanesville Parallel Company's Tracks

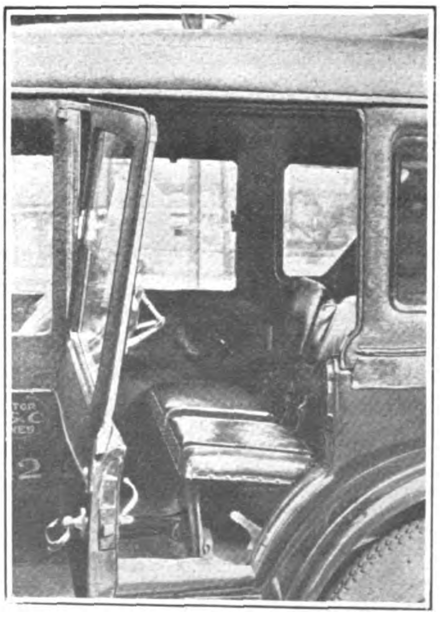
Drivers get 45 cents an hour and are paid for ten hours of operation. A careful check has shown that from seven-tenths to eight-tenths of this time is actual operating time. Hence, platform wages are in the neighborhood of 2 cents per bus-mile. It was soon found that the total operating costs were approximately 9 cents per bus-mile. This is based on a three-year life, or an estimated mileage of 150,000 miles. In the 9 cents, however, only that portion of the railway overhead represented by actual expenses incurred incident to the bus operation is charged against the buses.

This schedule showed a loss due primarily to the small load factor incident to the long hours of operation. When the service was changed to a so-called daylight schedule, namely, from 7 a.m. to 6 p.m., corresponding with the hours operated by competitive lines, the revenue was increased from 8 cents to 11½ cents per bus-mile, with practically the same operating costs per mile. The change in schedule gave a slightly increased fixed charge per mile, but also resulted in a reduction of 30 per cent in the number of miles operated per day and a consequent reduction in the depreciation rate.

The estimated life of 150,000 miles per vehicle is based on experience with motor cars which have already been in service for more than 100,000 miles. It is estimated that this mileage will allow cars to be scrapped before any serious increase in maintenance cost or service delays is experienced. Rigid inspection and prompt renewal or replacement of defective or questionable parts are practiced and are considered very important in connection with obtaining reliable service for this mileage from each vehicle. Tires, which are the most frequent cause of road failures and delays, are inspected and examined at frequent intervals and removed as soon as any question arises as to their condition.

The maintenance charges, over a six-month period, including vehicles which had made more than 90,000 miles, was 3¼ cents per mile. For the month of May, 1923, with entirely new equipment, the cost was 3.69 cents per mile, whereas during the month of September, after six months of service, the cost was 2.93 cents per mile.

A mechanical organization for the maintenance of the bus equipment has been built up entirely separate from the regular railway maintenance forces, with the exception that the garage foreman reports to the railway master mechanic. A separate building is equipped for the maintenance, storage and servicing of the buses and mechanics trained in automobile maintenance are employed for this work.



An Additional Seat Is Made by Bridging the Space Between the Two Regular Seats

The buses are operated by subsidiary organizations known as the Dayton & Columbus Transportation Company and the Columbus & Zanesville Transportation Company. Tickets are sold by agents in the interurban stations in the various towns through which the buses operate. Seats are reserved in advance when tickets are purchased. The station agent is provided with a diagram which is turned over to the driver at the time of the departure of the bus, showing the seat number, ticket number and destination of each ticket sold for that vehicle. The passenger's ticket also specifies the seat in the bus to which he is entitled. A diagram similar to a Pullman diagram is filled out, giving each passenger's destination. It provides for seven seats in addition to the driver. Room for one additional passenger is arranged by fastening the two folding seats in the rear section of the car together at the center and building a short extension on either side. The construction is illustrated in an accompanying illustration.

A bus driver's report envelope contains on its face full information covering the trip, and a separate envelope is used for each trip made. These reports are turned in to the cashier and contain all canceled tickets, cash fare receipts, stubs and the seat diagram for the trip. Cash collected en route is handled in another special envelope provided for this purpose. A bus driver's wheel report is used to inform the garage of all mechanical and tire defects. Drivers are required to give receipts to passengers for all cash fares collected. Careful accounting is made of the receipts on a form giving a complete record of the operation, and each driver is required to sign for the receipts issued to him. Daily reports of ticket sales are made by agents to serve as a further check on cash handled by employees.

Rules for the operation of buses were prepared as soon as this service was put into effect and included practically all provisions that have subsequently been laid down by the Public Utilities Commission of Ohio for the regulation of motor vehicles operating as public carriers. These rules include the following provisions:

(a) Drivers must operate in a careful and prudent manner, with due regard to traffic and use of the way by others, so as not to endanger the life and limb of any person.

(b) Drivers shall be American citizens, twenty-one years of age, of good moral character, must be fully competent to operate the vehicle under their charge, and shall have a certificate of license from the Secretary of State.

(c) No driver shall drink any intoxicating liquor during the time he is on duty, or at any time use intoxicating liquor to excess.

(d) No driver shall smoke any cigar, cigarette, tobacco or other substance while operating a motor bus.

(e) No driver shall carry on any unnecessary conversation with passengers.

(f) Upon approaching any bridge, sharp curve, steep descent or any other dangerous place, or in traversing such bridge, curves, jut way, descent or other dangerous place, the driver or operator of the motor vehicle shall slow down and have the vehicle under complete control.

(g) A driver of a motor vehicle shall bring it to a full stop before crossing the tracks of any steam or electric interurban railroad, such stops to be made not more than 75 ft. from the nearest rail of the crossing and at points where the clearest view of the approaching trains, locomotive or cars can be had. After making the stop hereby required, the driver shall carefully look in each direction for approaching trains, locomotives or cars, and if certain that no such trains, locomotives or cars are approaching, he shall then cross such tracks with the transmission of said vehicle in not higher than second gear. The foregoing does not apply to electric railways within public streets in municipalities.

In addition to the promulgation of these rules, the company has equipped all cars with red flags for emergency use in the daytime and fuses for use at night. All cars are equipped with chains, and the drivers are instructed to use them in slippery weather.

Insurance is carried in compliance with the state law of Ohio, which requires on seven-passenger cars the following total liability: $6,000 for any recovery for any personal injury by any one person, $12,000 for all persons receiving personal injury by reason of one act of negligence, $1,000 for damage to property of any person other than the assured. The insurance against damage by collision is carried by the transportation company. The liability insurance has been placed with old line companies on an experimental basis. Under this arrangement all cars are covered by insurance for a minimum rate and it is expected that the final insurance rate will be worked out at the close of the year on the basis of the car-hours in service, taken from bus drivers' time slips, deducting from them such time as dead layover time at terminals. The company and the insurance companies have co-operated with a view to working out an equitable basis for this form of insurance.

Bonus for Increased Revenue

Pay of Employees Goes Up One Cent per Hour with Every Cent of Passenger Revenue per Car-Mile Over Previous Average

A VERY simple profit-sharing plan has been in force on the New York & Queens County Railway since July 1, 1923. It provides that for every cent above 31 cents which the railway earns in passenger revenue per car-mile during any month the wages are increased during the following month one cent an hour over a specified basic wage. Those who participate in this bonus include all transportation employees except the superintendent, all mechanical department employees except the superintendent and shop foremen, all line department employees and all substation employees except the chief engineer. The trackmen are not included, as the service of individual trackmen on the property is far less continuous than with any of the other classes.

The plan was announced by Gen. L. C. Andrews, receiver for the company, last June, and 31 cents per car-mile was the figure set for the men to exceed, because that had been the average receipts of the system subsequent to the appointment of the receiver. The basic transportation wage, to which the bonus is added, went into effect at the same time as the bonus system, and is somewhat higher than that previously in force. It is on a ten-year schedule, like the wages on the other lines in Greater New York, and is as follows:

For motormen and conductors, first year, 47 cents; second year, 49 cents; third year, 51 cents; fourth year, 52 cents; fifth year to ninth year, 53 cents; tenth year and thereafter, 55 cents. Operators of one-man cars receive 5 cents an hour in addition to this regular rate.

In his announcement General Andrews pointed out that the company wanted more revenue and the men wanted more pay. If they would help the company get the revenue, they could have part of it in the form of higher wages. The passenger revenue per car-mile during the previous year had averaged just under 29 cents, and since the receiver had been appointed it averaged just under 31 cents. This was the smallest car-mile revenue of any street railway company in New York. It was pointed out that if each operator would pick up only one more fare for each car-mile of his run, then the average car-mile revenue would be increased by 5 cents and the employees' pay also by that amount. The announcement promised also that each day the company would post at its carhouse the car-mile earnings of the day before and the average of the month up to that day, so that the men could see what their chances were of having a bonus the following month.

There are only two restrictions to the plan. The first is that a man must work at least 150 hours during the month in which the increased earnings are created to receive the bonus during the following month. The second relates to accidents. Where a liability accident results in a settlement in favor of the claimant and investigation has shown that the accident was the fault of the motorman, he is obliged to forfeit thirty days of his increased pay, effective immediately after the decision of the general manager. The announcement also suggested ways in which the different kinds of employees could help. On this point it said:

HOW TRANSPORTATION MEN CAN HELP TO INCREASE CAR-MILE EARNINGS

By keeping your eyes open and picking up every possible passenger.

By running on time, so passengers learn to count on the cars coming along.

By being courteous to passengers.

By making every passenger want to ride on our lines again.

By encouraging local riding during non-rush hours.

By avoiding accidents that tie up the road.

By taking care that every passenger puts correct fare into the fare box.

HOW SHOP MEN CAN HELP TO INCREASE CAR-MILE EARNINGS

By putting out shop jobs that will stand up on the road.

By putting out cars that are clean and comfortable to ride in.

By working with the trainmen to get cars on the road in time, to avoid dead mileage, and to live up to schedules.

HOW LINE MEN CAN HELP TO INCREASE CAR-MILE EARNINGS

By not blocking the line more than you can help while doing line work.

By getting on the job promptly in case of line trouble.

HOW EVERYBODY CAN HELP TO INCREASE CAR-MILE EARNINGS

By being a booster for the New York & Queens trolley service.

By co-operating with the other men in your department and in other departments in everything that affects the car service.

By working for the interests of our trolley lines in the same way that a man works for his own business.

By making it part of your job to be a salesman of the New York & Queens trolley service.

By keeping on the lookout for anything that will help make service better or cheaper and by telling General Manager Roberts about it.

The results since the plan went into effect on July 1 have been quite satisfactory. During June, 1923, the car-mile receipts were 32.1 cents, so that during July the wages were up 1.6 cents per hour. During July the increased wage earned was 1.4 cents per hour. The record for the year up to March 10, 1924, with corresponding figures for the previous year, follows:

EARNINGS AND BONUS ON NEW YORK & QUEENS COUNTY RAILWAY

Earnings per Car-Mile

	1922, Cents	1923, Cents	Increase, Per Cent	Bonus Payment, Cents per hour
June	29.6	32.1	8.5	1.1
July	31.6	32.4	2.5	1.4
August	29.1	32.5	11.7	1.5
September	29.5	32.8	11.2	1.8
October	28.2	31.8	12.8	0.8
November	27.6	31.6	14.5	0.6
December	27.7	32.3	16.6	1.3
January	27.2	31.8	16.9	0.8
February	27.5	30.9	12.4	...
March	30.1 (1 to 10)	32.5	8.0	...
April	30.7	....	....	...
May	33.7	....	....	...

It is impossible to say what proportion of the increased earnings, as compared with the previous year, is due to the bonus plan, because there are other factors which have tended to increase the passenger revenue. The management believes, however, that the greater interest taken in their work by the men, particularly the trainmen and inspectors, is responsible to a considerable extent for the better showing.

Better Illumination with Less Wattage

By E. E. Dorting
Lighting Engineer Interborough Rapid Transit Company, New York

Better illumination, aimed to speed up passenger movement within the "L" stations, has been provided by the Interborough Rapid Transit Company in several stations of the Manhattan Elevated. The new lighting system gives, without glare, a maximum amount of light at the turnstiles, with a nearly uniform intensity of illumination over the rest of the station. Four 75-watt lamps in dome reflectors mounted on the ceiling replace the old installations of ten 40-watt bare lamps mounted on wall brackets.

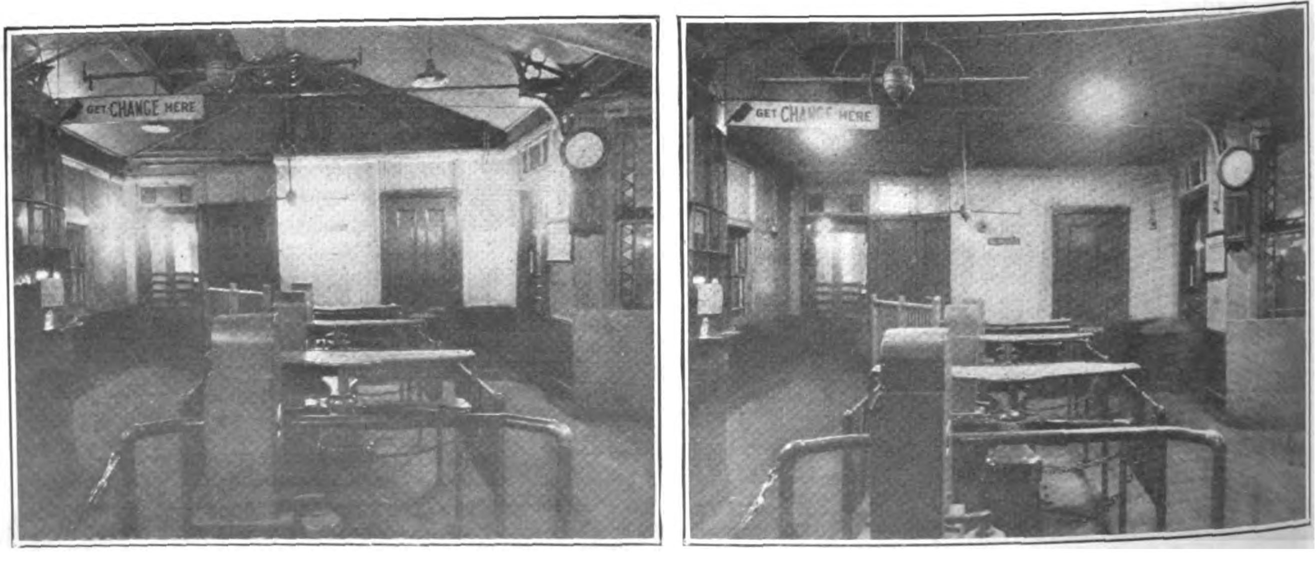
Both the lamp renewal cost and the operating cost are less for the new system. The renewal cost of the four 75-watt white Mazda lamps of the new installation at 55 cents each is $2.20, whereas the ten 40-watt bare lamps at 30 cents each cost $3. Four 75-watt lamps total 300 watts, while the ten 40-watt lamps total 400 watts—a saving of 100 watt-hours for each hour the lights are lighted.

While the Interborough has been confronted with the problem of designing and equipping its stations to handle larger and larger crowds, and traffic experts have arranged stairways, turnstiles and locations of doorways for accommodating a maximum number of people with a minimum of delay and confusion, until recently little consideration was given to the possibility of improved lighting as an aid to traffic congestion. Many tests have proved that a higher intensity of properly diffused illumination speeds up production in a factory, increases sales in a store, reduces traffic accidents. Good lighting is equally applicable to enable the hurrying "L" passengers to move along faster. At least the stations are brighter and more cheerful when they are well lighted, which fact alone warrants the change.

The old lighting system consisted of ten 40-watt bare lamps mounted on wall brackets. These were spaced about the station wall and gave considerable glare. On all sides the lamps threw unshaded light directly into the eyes of the people. The walls were brightly lighted, but there was not nearly enough light in the center of the station, and especially at the turnstiles, where the most congestion exists, and consequently a high intensity of light is important.

The new lighting system of four 75-watt white lamps in RLM standard dome reflectors largely eliminates the shadows. From the standpoint of glare the new installation is much better than the old as the units provide a high quality of well-diffused illumination, while their location close to the ceiling "softens" any glare as they are out of the line of vision.

Photometer readings taken at numerous points in the station show the average illumination to be increased 75 per cent, while over the turnstiles it was increased almost 350 per cent. The present average intensity of illumination in the station at the floor level is approximately 4 foot-candles. This greater effectiveness results from the use of a smaller number of large units equipped with efficient reflectors which direct the light where it is needed rather than allowing it to be wasted largely on the side walls.

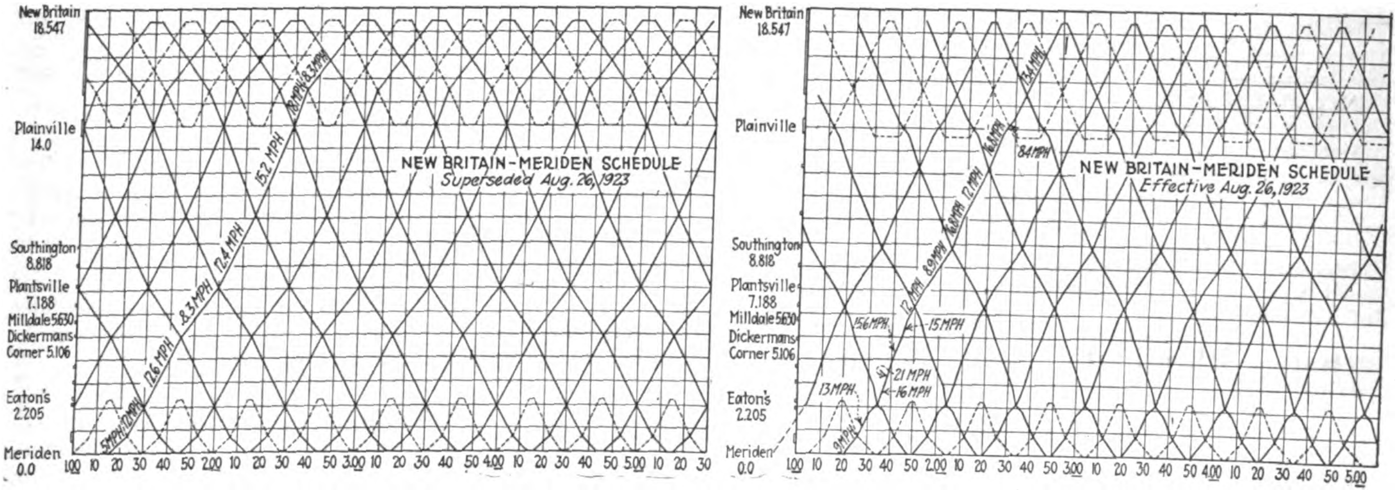


Old and New Method of "L" Station Lighting
Ten 40-watt lamps on wall brackets (left) have been replaced with four 75-watt ceiling lamps with reflectors (right), giving 350 per cent better illumination over the turnstiles, without glare.

Signals Reduce Operating Expenses

Block Signals Installed by Connecticut Company Pay for Themselves in Six Months by Reducing the Car-Hours Lost on Turnouts

AN INTERESTING example of the way in which block signals reduce the time of cars waiting at turnouts and so save operating expenses is shown by an installation completed last August by the Connecticut Company between Meriden and New Britain. The length of route between the center of Meriden and the center of New Britain is 18.547 miles and, outside of a short section of double track at each end, is single track with turnouts. This track is laid partly in side location, partly in the center of city streets and partly in improved state highways, and the route passes through Milldale, Plantsville, Southington and Plainville. All are fair-sized industrial towns with narrow streets.



One Car Less Is Required to Operate This Half-Hourly Schedule Since Signals Were Installed.
Old Schedule at Left, New Schedule at Right.

A portion of the afternoon time-table, from 1 p.m. to 5:30 p.m. before the installation of signals, is given in the first engraving. The through time-table was half-hourly, with an intermediate half-hourly local service out of Meriden as far as Eatons and out of New Britain as far as Plainville. This, with the through service, gave a fifteen-minute headway for short distances out from both Meriden and New Britain. There is also an additional fifteen-minute service, not shown in the chart, from New Britain as far as Corbin Avenue during the morning and afternoon on week days. These three local services are with one-man cars.

The through schedule shown had to be somewhat slack to give the cars ample time to make the turnouts at which they were scheduled to pass each other, and, as will be seen, seven cars were required to give this through half-hourly service. With the introduction of signals, it was possible to tighten up the schedule, so a car would make the half trip in one hour and twenty-eight minutes, instead of one hour and forty-three minutes. This allowed the service to be given with six cars instead of seven cars and gave a more dependable and faster service. While there were no more passing points, their location was changed, so that the change required the installation of two more turnouts. Altogether there are five passing points, but as two are on double track, only three turnouts are required. The old turnouts were left in position for emergency use. The cost of the two new turnouts was about $5,000, including some land which had to be purchased for one of the turnouts.

The cars used are four-motor double-truck cars, equipped with Westinghouse 101 or G.E. 80 motors. The speed given, as shown in the chart, is of course not high, compared with some interurban lines, but it must be remembered that the line passes through several small industrial towns and roads with many automobiles.

Before disturbing the schedule on the line, which had been in operation a great many years, and to which the patrons had become accustomed, the company interviewed a great many people who would be apt to be interested in the change, including the managers of the major industries. The advantages of the plan were explained and the co-operation of the various industries secured.

The cost of installing the signals was about $10,000, and even if the $5,000 spent for the additional turnouts is included as part of the cost of installation, the company estimates that the saving made from running the schedule with one less car pays for the entire improvement in about six months.

All-Electric One-Man Car in Holland

A NOVEL type of one-man car has been put in operation on the street car lines of Amsterdam, Holland. This is designed along similar lines to its American prototype, according to *Elektrotechnische Zeitschrift*, but differs in that it is not equipped with compressed air, being operated electrically throughout. Double doors, for separate entrance and exit, are provided at each end. These are opened and closed by ½-hp. electric motors with worm drive and slip clutch. The doors can be opened manually if necessity arises.

A dead-man handle is used on the controller, which is arranged to disconnect the motors, apply the brakes and light a red lamp at each end of the car if the motorman removes his hand. A foot-operated by-pass permits the temporary use of both hands for purposes of making change, etc. The car is driven by two 30-kw. motors. An electromagnetic rail brake in installed for regular use, while a hand brake can be used in emergency. The registering fare box is illuminated electrically so that the operator can see within it at night. The window in front of the motorman is inclined inwardly so that it prevents confusing reflections from the lights within the car which would hinder the operator in his work at night.

American Association News

Executive Committee

THE executive committee of the American Association met at headquarters in New York on April 11. The members present were President Britton I. Budd, Secretary J. W. Welsh, and Messrs. C. L. Henry, R. P. Stevens, J. H. Hanna, C. E. Morgan, C. D. Emmons, H. B. Flowers, R. I. Todd, Harry Reid, H. A. Johnson, J. K. Punderford, E. M. White, Barron G. Collier, M. B. Lambert for H. D. Shute, Cornell S. Hawley and A. A. Hale.

Mr. Henry reported for the committee on national relations, summarizing the recent work done at Washington. The matter discussed by Mr. Henry was covered in the issues of the ELECTRIC RAILWAY JOURNAL for March 29 and April 5. Mr. Welsh presented a report for the committee on subjects and meetings which outlined tentatively the program for the annual convention. The executive committee decided that one day should be devoted entirely to the reports and discussion of the committees on city operation and interurban operation. Otherwise the report of the subjects and meetings committee was approved as presented. It was also tentatively decided to devote one entire day to the inspection of exhibits and to that end there will be no business sessions during one day. Whether this exhibits day will be Tuesday or Wednesday will be decided later.

Mr. Budd spoke briefly of the great desirability of formulating some plan which would tend to make delegates to the convention attend meetings and take an interest in all of the proceedings as far as time permitted, whether of immediate interest in the delegate's own work or not. Suggestions were made that it might be helpful if every employee sent to the convention were required by his executive to report upon attendance and impressions of meetings and exhibits. The executive committee requested the president and secretary to formulate a letter to be sent to member companies to impress upon delegates the importance of attending to business while at the convention.

Mr. Collier reported for the publicity committee, outlining the activities of the past 60 days. E. C. Faber made a financial report on *Aera* for the publication committee, which showed the paper to be improving.

Mr. Stevens reported for the committee on company and associate membership, stating that three railway, one manufacturer and one associate members had been added to the membership. The new members are the Muncie & Portland Traction Company, Portland, Ind.; the Sioux Falls Traction System, Sioux Falls, S. D.; the Eastern Massachusetts Street Railway, Boston; the General Tire & Rubber Company, Akron, and the Buchanan & Layng Engineering Corporation, New York.

Mr. Morgan reported for the committee on individual members and company and community sections that there had been a net gain of five individual members since Nov. 1 of last year, and that there is at present a membership of close to 200 signed up toward the organization of the Metropolitan Community Section of New York.

A letter from W. H. Sawyer gave a preliminary financial report of the Midyear Dinner at St. Louis. The receipts will be approximately $7,500 and expenses slightly below that.

A report of the exhibit committee, which appears elsewhere in this issue, was presented by Secretary Welsh in the absence of J. C. McQuiston, chairman. The report stated that satisfactory contracts had been negotiated for holding the convention at Atlantic City, and recommended that a rate of 65 cents per square foot be charged for exhibit space. This was approved.

Annual Convention and Exhibits

A.E.R.A.

Atlantic City, N.J.

October 6, 7, 8, 9, 10

President Budd suggested the appointment of a committee of bankers, with the idea that they would take an active interest in electric railway financial matters and advise the association on these subjects. The association has special advisory committees on nearly every other phase of the industry but none on finance. It was thought that a committee of bankers would not only be of vital assistance to the association but would bring these men more actively into the association work. Furthermore, their knowledge of the association's activities would tend to bring a feeling of confidence with respect to electric railways into the financial circles. A motion was made and carried authorizing the president to appoint a committee to select and secure five bankers to serve on such a committee, preferably all located in New York so that they could readily get together.

F. C. J. Dell read a report for E. F. Wickwire, chairman of the committee on co-operation of manufacturers. In this it was pointed out that 41 manufacturers had been added to the list of those who were actively interested in co-operating with the association. The report stated that the personal visits of Mr. Dell upon manufacturers in various parts of the country had been very well received and that it was thought this would be most helpful in promoting the spirit of co-operation.

On Referendum 43 of the United States Chamber of Commerce on transportation, the matter was referred to the committee on policy with power to act.

An invitation from the international railway association, which is to meet in Paris on June 16-22, was read, but no action was taken as to official representation.

Mr. Johnson reported that the Engineering Manual, which has been revised and prepared for publication in book form by the Engineering Association, would be ready for distribution within the next 60 days. The plan is to print 2,200 copies, of which 1,200 will be bound and the remainder held for binding later if needed, or for binding in sections if companies desire a supply of the matter pertaining to any particular department. The bound volumes will sell to members for $5 and to non-members for $7.50, and a credit of $1.50 will be allowed upon the return of the old Manual. The idea of this refund is to encourage the use of the new Manual in place of the old one, much of which is obsolete. This plan of distribution was approved.

Some discussion was introduced by Mr. Stevens on inconsistencies in the present membership provisions of the association. After an expression of views by several members, the question was referred to the committee on policy with instructions to report back in time for a revision of the constitution to be made at the annual convention, should this appear to be desirable.

The next meeting of the executive committee will be held on Wednesday, May 7, at 4 p.m. in Cleveland, during the annual meeting of the United States Chamber of Commerce, which opens there on Tuesday.

Exhibits Committee

THE committee on exhibits reported to the executive committee on April 11 that it had completed negotiations with the officials in charge of the convention and exhibit facilities at Atlantic City. Proposals for rental of Young's Million Dollar Pier had been submitted by the Associated Realties Corporation and, after considerable negotiation of all terms and conditions, had been made acceptable to the committee, and the contract was recommended for signautre by the association.

The committee had also received proposals from the other contractors at Atlantic City including those for furniture, floral decorations, drayage, etc. These have all been approved.

The committee carefully considered the probable sale of space for this year as well as the expenses to be incurred and formulated the following budget which was approved by the executive committee:

Expenditures	
Exhibit expense	$33,015
General convention expenses	9,250
Entertainment expense	5,000
Total expenditures	$47,265
Estimated Receipts	
Sale of exhibit space—60,000 sq.ft. at 65 cents per square foot	$42,250
Contribution from Hotel Men's Association	3,500
Total estimated receipts	$45,750

$47,265
45,750

$ 1,515—Total Deficit

The committee considered this a very conservative estimate, and believed there would probably result a profit rather than a deficit. The rate of 65 cents a square foot for exhibit space, the same as last year, was recommended. This was approved by the executive committee.

This report and the action of the executive committee assure the convention being held in Atlantic City during the week of Oct. 6.

Engineering Executive

A MEETING of the executive committee of the Engineering Association was held on April 9 at association headquarters, New York. Those present were President H. A. Johnson, chairman; R. C. Cram, Daniel Durie, C. R. Harte, M. B. Rosevear, C. H. Clark, R. H. Dalgleish, G. C. Hecker and J. W. Welsh.

Mr. Harte reported on the progress of projects being handled with the American Engineering Standards Committee, and Mr. Dalgleish reported on the progress of work in which the Bureau of Standards is co-operating.

Considerable time was given to discussion of the publication of the new Engineering Manual. This is now in the hands of the printers, and it is anticipated that distribution can be begun within a month. The book will contain about 1,000 pages. It was agreed that it should be bound in cloth, uniform with the annual proceedings, and that it be sold to members and others at a price sufficient to cover the cost of publication. It was considered desirable that, in order to retire the existing Manuals, a rebate be allowed on the price of the new book in case an old one is returned.

In addition to the bound volumes it was voted to prepare separate pamphlets in paper covers, divided according to the eight general sections in which the new Manual will be printed, to be sold in response to requests for individual specifications.

The committee adopted a resolution expressing the appreciation of the association to the manual committee, Messrs. Cram, Harte, Durie and Hecker, for the thoroughness with which it has done the work of revision and publication of the new manual.

President Johnson reported that the approval of the American executive committee had been given to the request of the heavy traction committee to have Prof. R. G. Warner prepare a bibliography of heavy electric traction. It is proposed to mimeograph this material and supply it to members and others. The price will be determined later.

Mr. Dalgleish reported that he had several conferences with the Bureau of Simplified Practice of the Department of Commerce relative to the simplification of car parts resulting from an article in ELECTRIC RAILWAY JOURNAL for Sept. 29, 1923. It was agreed that the matter should be referred to the committee on unification of car design.

A sub-committee of the Engineering Association reported on relations with the A. E. S. C. It was felt that a more effective means for handling these activities is needed, as the existence of the A. E. S. C. undoubtedly will have a marked effect on the committee work of the association. Recommendations were made with regard to the procedure so as to safeguard the interests of the electric railway industry. The report was approved for presentation to the A. E. S. C.

Reports were made on a number of projects for standardization, which it was proposed to submit to the A. E. S. C. jointly with the American Society for Testing Materials. These included a specification for hard-drawn copper trolley wire, five specifications for sundry track materials, and one for open-hearth girder rails.

Several other activities were also discussed in which the association is co-operating with other bodies.

Two plans were presented for the program of the Atlantic City convention, one for a four-day schedule and the other for three days. A tentative program was approved subject to revision by the president and the secretary. Approval was given to hold a session of the purchasing agents and storekeepers, similar to that of last year.

An effort will be made to have an exhibit in the association booth showing the A. E. R. E. A. standards.

A recommendation was approved that the committee on subjects be appointed at the beginning of the association year in order to give more time for the consideration of subjects.

City and Interurban Directing Committee

A NEW committee has been formed to direct the activities of the committees on city operation and interurban operation. It consists of the chairman and one regional vice-chairman of each committee, together with the secretary and a representative of the president. A meeting of this new directing committee was held at New York on April 10. Those present were Chairman H. B. Flowers and Regional Vice-Chairman R. F. Carbutt of the city committee, Chairman Harry Reid and Regional Vice-Chairman H. L. Mitchell of the interurban committee, Secretary G. C. Hecker and E. J. Blair.

It was planned to request the subjects and meetings committee to arrange for the presentation at the convention of a brief report by each regional vice-chairman on his activities. For the preparation of the final report the form of operating handbook originated by Mr. Carbutt was approved as a guide for the collection of information. Arrangements will be made to send copies of the handbook to all regional vice-chairmen for use in their visits to properties.

Membership

THE committee on company and associate membership met in New York on April 10. Members present were Chairman R. P. Stevens, C. E. Morgan, H. B. Flowers, Edward Dana, H. B. Potter, A. Flor, K. A. Simmon, R. F. Carbutt, Charles W. Kellogg, E. P. Waller, Harry L. Brown, F. C. J. Dell and Secretary J. W. Welsh.

Mr. Stevens reported the results of his extended correspondence with nonmember companies, and each member of the committee was assigned the nonmembers in his vicinity so that he might follow up the correspondence of the chairman by personal call.

Rapid Transit

THE committee on rapid transit met in New York on April 10 with Chairman W. S. Menden and the following members of the committee present: Edward Dana, B. J. Fallon, James Walker, W. S. Twining, L. H. Palmer, W. H. Maltbie, R. F. Kelker and Secretary J. W. Welsh.

The committee discussed at considerable length the work which might profitably be undertaken by this committee and tried to arrive at the scope of work which it could expect to complete this year. It seemed to be the sense of the meeting that the work should be confined to that of gathering facts as to the circumstances surrounding the construction, financing, operation and regulation of the existing rapid transit systems.

Coffin Prize

A MEETING of the Charles A. Coffin Prize Committee of the A. E. R. A. was held in New York on April 11. Some suggestions had been made that it might be desirable to have, in addition to the main prize, recognition for other companies in the form of an "honorable mention" or "award of merit" for the four or five leading contenders for the prize. Some doubt was expressed by the members of the committee as to the wisdom of this proposal and a letter from J. G. Barry, vice-president General Electric Company, stated that the proposal had been discussed by the officers of his company and they had unanimously agreed that they believed only the single prize should be awarded. His letter suggested, however, that the practice followed by the committee last year of sending letters to the various contestants, pointing out the principal things in which they excelled, should be continued.

A title for the book which is being prepared by H. H. Norris from the proceedings last year was approved, namely, "Electric Railway Practices in 1923."

Those present at the meeting were James H. McGraw, W. W. Trench, E. J. Blair for Mr. Budd, C. D. Emmons and Secretary Welsh.

Maintenance of Equipment

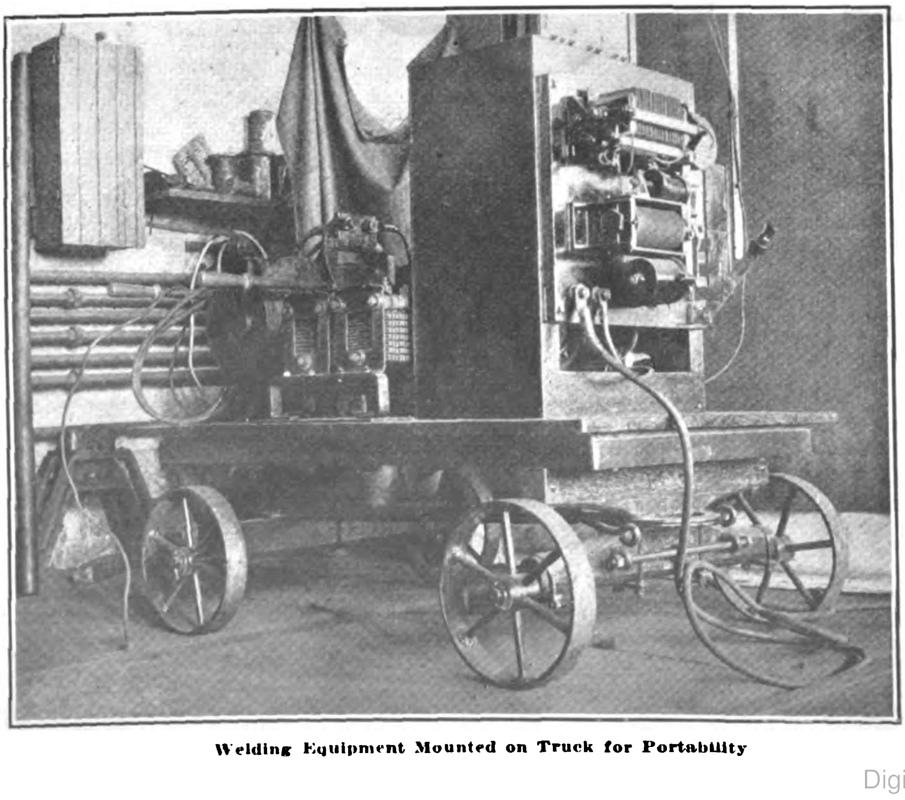
Making the Welding Set Portable

WHILE a welding room offers facilities that are not available in cases where the welding set is taken to the job, still there are cases frequently occurring where it is inconvenient to take the work to a fixed welding room. Sometimes, by taking the welding set to the job, much work can be saved in dismantling parts which would otherwise be necessary if a portable welding set were not available.

To meet such conditions, the Philadelphia & Western Railway, Norristown, Pa., has constructed a truck for its shop welding set. The various switches and resistance for control of the welding equipment are mounted permanently on top of this truck, as shown in the accompanying illustration. The set can thus be used either in the welding room or at any other point where welding current is available.

The truck consists of a wooden platform with four wheels, the two forward ones being arranged to swivel and thus make short turns readily. In order to make the top of the platform level, the rear end is supported by two straps, which rest on top of the rear axle. A center bearing with support is provided for the front axle, so that this can turn. A rod on the forward side of the front axle provides a means for attaching a handle. This handle is made with hook ends, so that it can be readily attached. When not in use it is placed inside underneath the platform of the truck, so that there is no danger of workmen falling over it, as might occur if it were left projecting out from the truck.

The wheels of the truck have a diameter of 14 in. They were constructed in the shop by bending a band of iron to a circular shape and welding six spokes and a hub in position. The hub is made of a piece of armature shaft. Its diameter is 3 in. and its length 4 in. The axles of the truck are of wood with 1¼-in.-diameter steel rods attached underneath. These are turned down to 1-in. diameter where they pass through the wheel hubs.



Welding Equipment Mounted on Truck for Portability

Weather Is Primary Cause of Signal Failures

By H. J. Charters

Portland Railway, Light & Power Company

THE annual report of block signal operation on the lines of the Portland Railway, Light & Power Company, Portland, Ore., for the year 1923 shows that adverse weather conditions are the most frequent cause of signal failures. During the summer and fall months the failures are comparatively few, although on account of extra trains the daily signal movements are more numerous than at other times. In June, because of severe electrical storms, there were more failures than in any other month.

ANALYSIS OF SIGNAL FAILURES, PORTLAND RAILWAY, LIGHT & POWER COMPANY

	1921		1922		1923	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Line wires	5	4	5	7	6	6
Switch and pole wiring	2	2	3	4	12	11
Blown fuses	7	6	3	4	15	14
Directional relay	29	25	22	30	34	31
Signal trouble	6	5	1	1	3	3
Contactors	44	38	26	35	24	22
No. 5 switch	7	6	2	3	8	7
Miscellaneous	6	5	1	1	0	0
No trouble found	11	9	11	15	6	6
Totals	117	100	74	100	108	100

Directional relays and contactor difficulties were the most frequent causes of interruption notwithstanding the fact that the original No. 5 contactors had been replaced by more rugged home-made devices at all points where high speed is maintained. For the last three years the number of contactor failures has shown a steady decrease. Fuses and

SIGNAL FAILURES BY MONTHS AND YEARS

	1921	1922	1923
January	..	6	22
February	..	5	10
March	10	3	13
April	13	8	8
May	17	4	8
June	9	15	16
July	16	8	6
August	12	1	8
September	8	1	4
October	6	8	2
November	16	6	6
December	10	9	5
Totals	117	74	108

switch and pole wiring were also important causes of interruption. Cases where no trouble was found were numerous and constitute a considerable part of the reported failures, but it is felt by the railway that it is better to report a signal out of order and inspect it than to "take a chance."

The total number of signal movements during the year was 991,082, the same as during the preceding year. The number of failures was slightly greater on account of bad weather conditions. The durability of the type G1 United States signals, however, has been notable. After being in continuous service for 10 years, they required in most cases nothing but cleaning and adjusting to place them in perfect order.

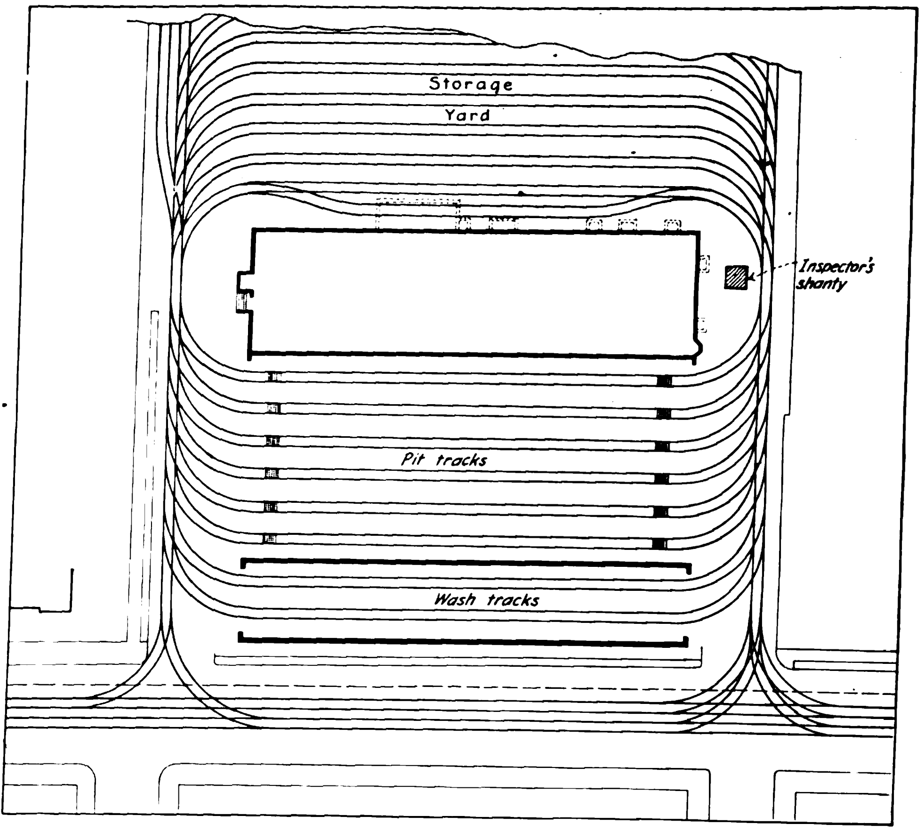
Detachable Letterboard Simplifies Spray Painting

THE Boston & Worcester Street Railway has adopted the spray painting method for use on the exterior of its cars. The process is simplified as much as possible by the elimination of striping, lettering, etc. A single shade of brown is used for the entire side. Repainting of cars is done more quickly and cheaply on account of the practice of having a detachable letterboard. This is a long wooden strip about three-quarters the length of the car body bearing the legend "Boston & Worcester Trolley Air Line." When a car is being repainted this letterboard is removed. It can be brightened up by washing and varnish, and the expense of relettering the whole sign can thus be saved.

A Track Layout that Facilitates Inspection

THE track layout of the North Main Street carhouse and the adjacent yard of the Springfield Street Railway, Springfield, Mass., has been so designed that all entering cars pass an inspector's shanty. The motorman is required to stop at the shanty and find out from the inspector on duty there where his car is to be placed. The storage yard for cars consists of thirty-one loop tracks, each having a capacity of five cars. The entrance from the street and a portion of the storage tracks are shown in the accompanying diagram. The inspector on duty in the shanty makes a note of the location to which he has assigned the car as it enters the yard. By referring to this list, he is able to tell at any moment exactly where any particular car has been ordered placed.

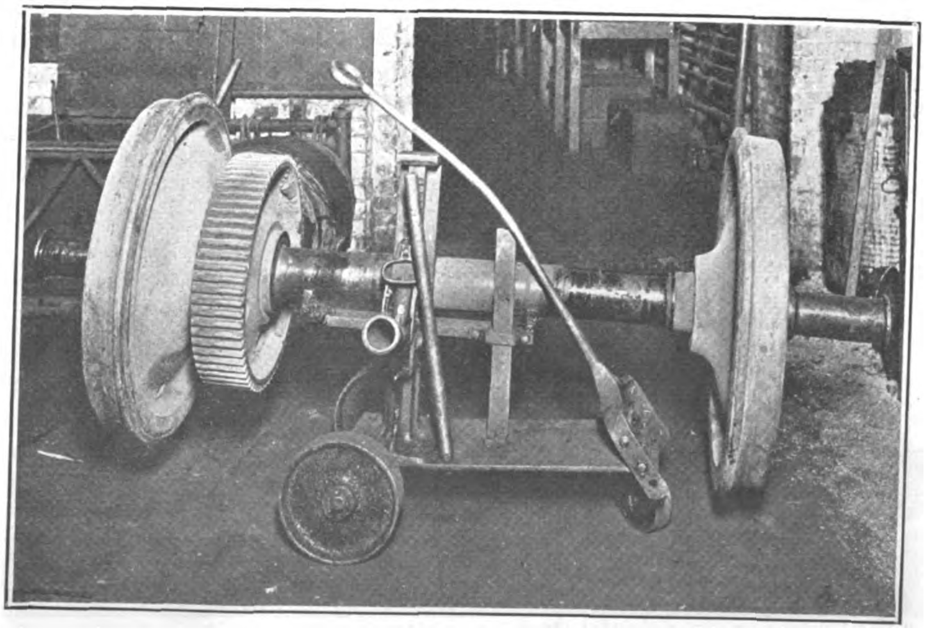
A washroom in the house has two tracks and will accommodate ten cars. Alongside of this is a pitroom with six tracks accommodating thirty cars. About twice as many cars are washed and inspected each night as can be placed simultaneously in the washroom and pitroom. The procedure is for the inspector at the shanty to assign the first batch of cars to the washroom and pitroom. The motormen pulling in during the evening leave their cars there. After work has been completed on these cars they are run out into the yard and a second batch brought in.



All Entering Cars Must Pass the Inspector's Shanty and Are Assigned by Him to Specific Tracks

Handy Truck for Moving Wheels

A VERY convenient apparatus for moving a pair of wheels mounted on an axle from place to place in the shop has been devised by the welding foreman of the



Simple Cart for Moving Wheels at Worcester

Worcester Consolidated Street Railway, Worcester, Mass. This is a little truck with two 11-in. steel wheels at one end and a revolving castor at the top. On the floor of the truck has been fastened a Barrett jack equipped with a special support to fit a street car axle. This little cart is placed directly under the axle to be moved, and by manipulating the jack the axle is raised sufficiently for the wheels to clear the floor. The cart can then easily be moved to any part of the shop.

New Equipment Available

New Highway Crossing Signal

On its line to Erdenheim, a suburb beyond Chestnut Hill, the Philadelphia Rapid Transit Company recently installed a new type of highway crossing signal made by the Nachod Signal Company, Louisville, Ky. This gives indications by a bell and flashing lights. At this location the double-track trolley line crosses the Bethlehem Pike, a main automobile highway out of Philadelphia on which traffic is quite heavy. The crossing is at right angles to the track at the bottom of a long grade on the highway.

The signal is set on a concrete foundation, with a relay box mounted on a pipe standard, at the top of which is a large bell. Brackets attached to the standard hold two parabolic reflector units each fitted with a red cover glass and a 23-watt lamp. A large portion of the light is projected into an approximately parallel beam, thus giving a brilliant indication by day as well as by night. The projectors are pivoted on gimbals, so that the beams may be accurately directed along the highway in both directions.

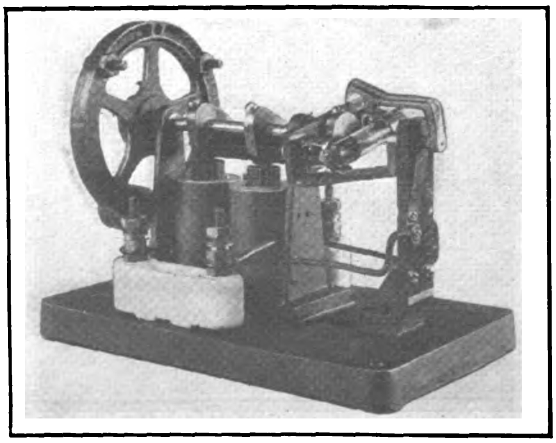
Control of the signal is through overhead trolley contactors of the wiping type, four of which are required for this double-track installation. As the car movements are comparatively slow at this point, the starting contactors are located only a short distance from the highway in each direction.

The light is flashed by a new form of oscillator-type flasher relay shown in an accompanying illustration. The lamp circuit is broken by the tilting of a sealed tube containing mercury, to break the connection between terminals within the tube. On a test of this flasher relay twenty 23-watt lamps on a 600-volt circuit were flashed, the circuit being broken more than 10,000,000 times without any noticeable deterioration of the contacts. The relay base measures 9½ in. x 5¾ in.; it is 7⅛ in. high, and weighs 10 lb. It is said to be noiseless, smooth in operation, and to require little maintenance except lubrication once a month. The flashes are at the rate of sixty per minute in this installation, although the frequency is adjustable.

RAIL ROAD
CROSSING

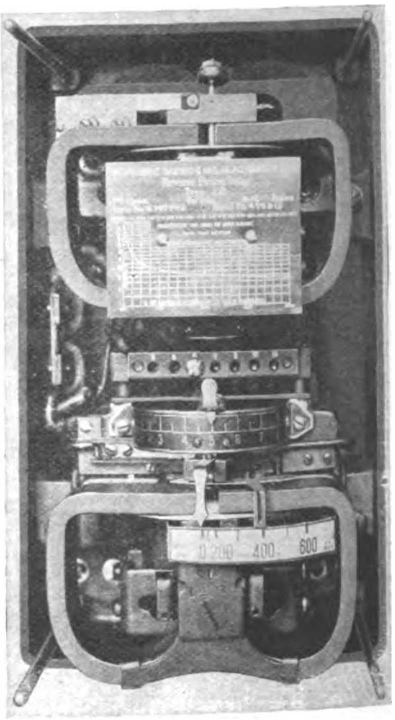
New Signal Recently Installed Where the P. R. T. Crosses the Bethlehem Pike

Below, the Contact in This Relay Is Made and Broken by the Movement of Mercury in the Tube



Relay with Self-Contained Ammeter

A line of over-current and directional relays equipped with a current-indicating element is a new product of the Westinghouse Electric & Manufacturing Company. These relays, known as COA and CRA, differ from the company's standard CO and CR over-current and directional relays in that they have self-contained ammeters which give a continuous indication of the current flowing in the circuit to which the relay is connected. They are designed for use where the relays are mounted on the front of a switchboard and where there is insufficient room to provide separate ammeters.



This Type CRA Directional Relay Incorporates a Current Indicator

In addition to operating as protective relays, these relays indicate the current flowing through the relay circuit, which not only shows the current in the feeder, but also proves that the relay is receiving current and is in condition to operate if a short circuit should occur.

The indicating element is mounted on a separate shaft and has its own jewel bearing and control spring, but is actuated by the same flux which operates the contacts of the relay. This prevents the indicating element from operating when there is any trouble either inside or outside the relay that would prevent the main electro-magnet from being energized.

The News of the Industry

Compromise Transit Bill Passed

New York City Authorized to Engage in Municipal Operation Under Self-Supporting Fares—Present Transit Commission Continued in Office with Supervising Powers

The Legislature of New York has passed the compromise transit bill for the city of New York and the constitutional amendment authorizing the issuance of bonds to the amount of $300,000,000 for grade crossing elimination, which must be passed by another legislature and receive approval by the people. The Assembly stopped the passage of the Ryan bill, which would have restored 5-cent fares in Troy, and killed the constitutional amendment which would have permitted the city of New York to borrow $275,000,000 for transit construction, which amount would be exempted from the debt limit of the city in the same manner as water bonds are now exempted. All of the administration program for municipal ownership and regulation of public utilities failed to pass in the Assembly.

GENERAL SESSION DISAPPOINTING

Final decision on many of these things remained an uncertainty, however, up to the last hour. With the desk force of the Senate and Assembly swamped by hundreds of bills amended and passed in its closing hours the legislature adjourned as of April 10. It is said that never before in legislative history in the State has an adjournment been had in such confusion. The clerk had been on practically continuous duty for seventy-two hours. It will be days before the fate of many measures is definitely known.

The compromise bill affecting transportation in New York City was reached as a result of the conference between the Senate and Assembly committees. Substantially the terms of the bill are as follows:

1. All construction and equipment of all new rapid transit railroads, including the determination of new routes, passes to the city.
2. All uncompleted construction under the dual subway contracts is to be under the jurisdiction of the city.
3. The city is authorized to engage in municipal operation or to lease for operation all new rapid transit lines.
4. If the city engages in municipal operation the fare for an initial period of three years shall be 5 cents, but after such time such operation must be self-sustaining, and the revenues sufficient to pay operating expenses, maintenance, interest, amortization and to provide a reserve for depreciation.
5. The powers of the city are to be exercised through a Board of Transportation of three members to be appointed by the Mayor, originally for two, four and six years and thereafter for six years. No salaries are provided, the Board of Estimate and Apportionment being authorized to determine the amount thereof.
6. The present transit commission is retained in office, with power of supervision and regulation of existing rapid transit lines, and the administration of the dual subway contracts, except construction of uncompleted parts and additions and extensions.

The additional power conferred on the Transit Commission by the legislation of 1921 authorizing the commission to adopt a plan of readjustment of existing lines is not disturbed.

All employees of the Transit Commission engaged in construction work will be transferred to the Board of Transportation.

Aside from the transit legislation the New York State legislature closed with less accomplished than in many years. Its chief performance was the passage of a 25 per cent income tax reduction good for 1924 only, the presentation of a home rule measure for cities, much of the interpretation of which will be for the courts to decide, and a constitutional amendment providing for the issuance of grade crossing elimination bonds.

The water power measure was aided by Republication votes, among them Senator Davenport, who declared in voting for the Rabenold bill that the people had spoken at the last election on the defeat of the Ferris amendment to the constitution and that they wanted the ownership of water power to vest forever in the people of the State.

In the Assembly a bill was introduced by Mr. Davison of Nassau county adding a new section, 261-b, to the General Corporation Law, by providing that preference in payment of judgments recovered in actions for torts against public service corporations shall be given in liquidation of affairs of the corporation.

The proposal of the Governor for a commission to devise ways and means to relieve public service corporations of unequal taxation met defeat in the Assembly, the speaker holding that the Davenport committee has already covered most of the gound that such a commission might explore.

Use of Canal Bed Urged for Newark Transit Line

Construction of a rapid transit line by either the city or the Public Service Railway, Newark, N. J., along the bed of the Morris Canal between the Pennsylvania Railroad at River Street and Bloomfield Avenue was suggested on April 7 by Thomas N. McCarter, president of the Public Service Corporation. Mr. McCarter stated the case of his company at a conference of the City Commission with representatives of the railroads and the Public Service Railway to determine what should be done with the canal property. The cost of adapting and equipping the property for rapid transit purposes is estimated at $2,500,000. Mr. McCarter said that plans for a rapid transit line such as the company proposed would be ready in about a week and would be submitted to the city.

Five suggestions were made in the Public Service statement on the plans for the use of the canal property. The opening paragraph stated that it was on the "assumption that there is to be within a reasonable time a co-ordinate railway and bus service under one management, furnishing local transportation so that railway financing can be accomplished," that the Public Service made the suggestions.

Scranton Strike Settled

After a strike of four and a half days, the cars on the lines of the Scranton Railway, Scranton, Pa., began operating on April 5, following an agreement between the employees and the management whereby the men accepted the rush-hour run with modifications and consented to the matter of wages going to arbitration. Trainmen are demanding an increase of 17 cents an hour.

As was reported in the ELECTRIC RAILWAY JOURNAL of April 5, the management and the employees could not come to an understanding on the demands made by the Amalgamated for a new contract. The management presented a new agreement requesting that the men operate rush-hour tripper service morning and afternoon, with time to be worked on these runs eight hours and the spread to be five hours. After a number of conferences the division agreed to waive all demands in its proposed agreement except wages and rush-hour runs, nor would they arbitrate them.

The men said they would arbitrate the wages, but would not arbitrate the rush-hour runs. Consequently, there was a deadlock until late on April 4, when the men yielded from their stand and agreed to accept the rush-hour runs with the modification of straight time for the morning service and time and one-half for the afternoon service. This the management agreed to since the men waived all other demands and agreed to submit the wage question to arbitration.

The proposal for rush-hour tripper service makes the following provisions:

1. Rush-hour tripper runs operated in the morning shall be paid at the regular rate of wages, for the first four hours or any part thereof.
2. After eight hours continuous time, after schedule time of leaving carhouse the rate of wages shall be paid at the rate of time and one-half per hour.
3. No tripper runs shall exceed thirteen hours from time of leaving carhouse in the morning.
4. All motormen and conductors assigned to regular tripper runs shall be guaranteed eight hours pay at the rates specified in clause No. 2 of this proposal.

Indiana Union Traction Takes Over Bus Operation

The Union Traction Company, Anderson, Ind., has completed negotiations with the several bus owners of Muncie for the company to take over and operate all lines that have been running more or less regularly since granting the recent court injunction.

By the terms of the sale entered into by the traction company and the bus men, the company buys the rolling stock from the several owners, including not only the half dozen or more large buses that have been running over well-established routes to the different parts of the city, but also becomes owner of touring cars run on irregular schedule during the winter.

While it is extremely probable that a few of the established routes will be changed, it is understood that all of the buses will be continued in use. The plan is to place more street cars on certain runs where street car traffic has always been heaviest. In other places the buses will be used in auxiliary service.

Rochester & Syracuse Injunction Against Buses

The Rochester & Syracuse Railroad has been granted an injunction by Supreme Court Justice Cheney restraining temporarily the operations of the United Arrow Lines, Inc., operators of a motor bus route between Syracuse and Rochester. The temporary injunction will be in effect pending action for a permanent injunction.

The application for the order was based on the claims that the bus line had cut into the profits of the railway and had operated without authority from the Public Service Commission and the municipalities through which it passed. Fred H. Hout, John Griswold and Norman Waterhouse are named in the order as partners in the bus line.

The Arrow line began operations about March 27 and made two trips daily from Rochester to Syracuse. It operated a 25-passenger Pierce Arrow bus. The fare was $3.90 one way.

Suburbs of Vancouver to Have Rapid Transit

A new entrance into Vancouver, B. C., is planned by the British Columbia Electric Railway for its interurban lines, which will bring both freight and passenger trains into the heart of Vancouver without the use of city streets. It is estimated that it will cost $1,000,000. At the present time, Central Park, Burnaby Lake and Fraser Valley trains operate over 3½ miles of city streets on which there is a frequent service of city cars. At the point where the private right-of-way ends it is proposed to drop into a short tunnel, then running by means of depressed tracks, using a creek bed to a reclaimed area in the heart of Vancouver known as False Creek. By way of a disused Great Northern Railway right-of-way and bridge, trains will be brought into the back of the company's terminal station. This will cut off at least ten minutes from the running time between Vancouver and New Westminster and virtually bring rapid transit service to the suburban population between the two cities.

Investigation Completed

Wisconsin Commission Recommends Double Tracking Most of System and Purchase of New Cars

The Wisconsin Railroad Commission, which has been conducting an investigation of the service of the Madison Railways, has recommended double tracking for virtually all parts of the system as soon as possible and the purchase of seven or eight new cars before next December. The investigation and report were made by C. M. Larson, chief engineer, on order of the state commission following many complaints received from the public during the severe cold weather of last winter.

The report suggests that the people who complain so much in general terms study the service rendered in other cities which compare in size with Madison and they will find difficulty in referring to a place where the service compares favorably with Madison.

Mr. Larson found that cars were overloaded on most of the lines during the morning, afternoon and early evening rush periods, "causing inconvenience and discomfort to the passengers and resulting in delays that slow up cars and distort schedules."

The investigation showed that the company owned 12 miles and 142 ft. of first main track and only four miles and 1,858 ft. of second track. The report recommended that certain parts of the system be double tracked as soon as possible.

In making their investigation, inspectors made counts of the passengers on all cars on all lines at the points of heaviest loading and also made observations of the intervals between cars. Intervals of fifteen to twenty minutes were numerous. Insufficient double track and cars were largely the cause of this condition.

According to the report there was overloading of cars during the morning rush on the Fair Oaks line and during the afternoon rush on the Fair Oaks, South Madison and North Street lines. It was recommended that improvements be made in the block signal system.

The report stated that it was true that during the rush periods larger cars would be much more satisfactory than those now in service. Many more passengers could be handled without the necessity of placing additional cars in service, but it said that there was another feature that could not be overlooked. During the larger part of the day the small cars have sufficient capacity. Larger cars would give no better service and the cost of operating the larger cars would be very much greater than the cost of operating the smaller ones.

Officials of the company expressed their desire to co-operate fully with the commission in carrying out recommendations contained in the report.

Franchise Extensions Arranged in Birmingham

Thirty-year extensions of franchises of the Birmingham Railway, Light & Power Company, Birmingham, Ala., covering 140 blocks of track were granted by the City Commission on March 25 in consideration of the payment of $35,000.

The steam heating franchise of the company was also extended by the commission for thirty years. The company agrees to furnish free heat to the City Hall and city jail as long as they are maintained in the present locations and the present contract remains in effect.

Approximately 90 per cent of the company's franchises were originally granted in perpetuity. The present extensions cover only about 10 per cent of the total.

Another ordinance was adopted providing that the discontinuance of service on any portion of a line with the consent of the city shall not work a forfeiture of the franchise if the company upon ten days' written notice from the city restores service. In the event tracks have been taken up and poles removed, the ordinance provides a reasonable notice in writing with allowance of time to replace the tracks and resume service. This same ordinance provides that in the event the city desires to pave any street upon which the company has a franchise for a double-track line, but has only laid one track, the company must make an election and either forfeit the franchise for one track, or else put down its second track, or as another alternative must pay for the same proportion of the paving it would have paid for had its second track been laid.

Maumee Valley Railway Ousted from City

The City Council of Maumee, Ohio, a municipality 8 miles south of Toledo, has passed an ordinance ousting the Maumee Valley Railway from operation within the city limits. The ouster was the result of a controversy between the city and the railway over the improvement of the main highway from Toledo to Maumee. The railway follows the highway.

Officials of Lucas County recently decided to widen the road to 27 ft. The Council of Maumee at the same time passed a resolution authorizing the widening of the road within the jurisdictional limits of the city to 32 ft. This would have necessitated taking over part of the right-of-way of the railway.

The city demanded that the railway move its tracks from the west side to the middle of the road. The company protested against the demand contending that the change would involve the expenditure of $85,000, which it was not in a position to undertake at this time.

L. G. Van Ness, president of the railway, said that the proposed improvement would be enjoined or the ruling of the Council appealed to the Ohio State Public Utilities Commission.

Thirty New Jersey Jitneys Ordered to Suspend

In decisions handed down on April 8 the Board of Public Utility Commissioners of New Jersey disposes of eighty-eight complaints filed by the Public Service Railway against alleged unlawful operation of jitneys in various cities in North Jersey. Thirty jitney drivers were adjudged guilty of unlawful operation and ordered to discontinue service by April 30. In the meantime applications may be submitted to the board for approval of municipal consents to operate buses. Complaints in twenty-six other cases were substantiated, but no order of discontinuance was issued, because applications for state approval have been filed since submission of the Public Service charges. The board will dispose of the question of the necessity for operation of these buses in a decision to be handed down later. Because the Public Service Railway failed to submit evidence in thirty-two other cases the complaints were dismissed.

Automobile Body Comments on Akron

The National Automobile Chamber of Commerce says that a great deal of misinformation grew out of the twenty-seven days' war at Akron. That body says that in the excitement it was utterly lost to view that the motor bus industry and the electric railway industry both join in the belief that the function of the motor bus and the street car—two distinct agencies of transportation—is to furnish co-operative transportation by means of co-ordination. The chamber says that the bus and the street car have not been, and are not, at war to exterminate each other. Complete motorization of a city's transportation service has not been the desire or the hope of the motor vehicle industry.

The statement by the chamber was prepared at the suggestion of a number of papers that wanted the story. In its statement the chamber further said:

> What has happened in Akron cannot be considered proof of any of the following hypotheses: That the motor bus as an agency of transportation fails to measure up to the street car; that the public prefers street cars because of certain positive advantages; that complete motorization of transportation is impracticable in a city the size of Akron.
>
> None of these points was supported by proof because of the confusion attending the sudden suspension of street car service and the over-night efforts of the city administration to induce free lance bus operators from various parts of the country to install bus service. The experiment was tried under the most unfavorable conditions as far as buses were concerned—whether one views the situation as a supporter of complete motorization or with the well-considered viewpoint of the motor vehicle industry which believes in co-ordination of buses with street cars to improve public service.
>
> The chief difficulty was that the city administration could not guarantee to a bus operator any franchise or stated period of operation. Not even a license could be given or even guaranteed; insurance could not be obtained, and inasmuch as the time was too short to get permits from the Public Utilities Commission there was not only no regulation of these common carriers, but contentions arose that laws were being broken.
>
> As a result, responsible bus operating companies having adequate and up-to-date equipment could not be induced to invade the Akron field. Only those willing to take a chance were attracted to Akron. The response was from the widest variety of free lance operators; their equipment was not regulated in size or type, and much of it was worn out or certainly inadequate.

Bus Extension in District of Columbia Authorized

The Public Utilities Commission of the District of Columbia has authorized the Capital Traction Company to extend its bus line, now operating between Randle Highlands and Seventeenth Street and Pennsylvania Avenue, Southeast, to the Eastern High School. The rate of fare is to be the same as the current rate of fare in force on the railway lines in the District of Columbia, or such other rate as may be prescribed by the commission. The commission also ordered that transfers between this extension of the bus line and the railway line of the company be issued at 2 cents each. The order is to take effect on May 15.

In authorizing this extension the commission stated in its report that the operation of a bus service over the route covered by the application of the Capital Traction Company would be of advantage not only to those desiring to go to the Eastern High School, but to the residents of the section south of East Capitol Street and east of Thirteenth Street, who are now without adequate transportation facilities. Further, that the operation of this bus line would not conflict with any of the bus routes the Washington Railway & Electric Company had indicated its willingness to operate in the eastern section of the city.

Offers Counter Fare Proposition for Jacksonville

At the conclusion of the hearing before the Florida Railroad Commission on the petition of the Jacksonville Traction Company for an increase in fares, Peter O. Knight, chief counsel, submitted a counter proposition to the city attorney's request that the cash fare be left at 7 cents and that twenty tokens be sold for $1. Mr. Knight's plan would afford the car riders a lower fare than the present one of 7 cents. The offer called for a cash fare of 10 cents, the sale of five tokens for 35 cents and the sale of weekly tickets at $1.25. In other words, patrons who would not care to purchase tokens would pay 10 cents for a ride. If they desired tokens, they could ride at the same fare now in effect, and if they bought a pass they could ride an unlimited number of times for the week for $1.25.

City Attorney Strum, in answer to the offer advanced by Counsellor Knight, declared that a cash fare of 10 cents would more than offset whatever good the token and ticket sales would do. He contended that he had not sought a straight 5-cent fare, but wanted the 7-cent cash fare retained, allowing patrons to ride for 5 cents on tokens. He said that to increase the fare above 7 cents would tend to decrease the number of car riders, which had already been dropping off considerably. To the contrary, Attorney Knight argued that the automobile had permanently affected the patronage of the railway and that the company's only hope was to get more money for its service.

He stated that the company had paid in dividends to its stockholders $744,000 during the past twenty-two years. He said that it had paid the city $371,438 in gross receipts taxes, $736,000 for paving and $254,000 in free rides, making a total of $1,361,000 paid to the city during this period.

The Railroad Commission reserved decisions.

Pittsburgh Men Present Demands

Following a joint conference on April 4 of the company's representatives and the wage scale committee representing the men it developed that 3,000 trainmen of the Pittsburgh Railways, Pittsburgh, Pa., are seeking an increase in wages from the present 67 cents an hour limit to the maximum rates of 75 and 77 cents. A new phase of the matter is the part the city is to play in the controversy.

The demands include a two-year schedule. Up to the present the wage agreements have been on a one-year basis. The wage demands for the two-year period, the second year's rates being a 2-cent an hour increase over the first year's rates, are as follows:

For the year May 1 to April 30, 1925: First three months, 68 cents an hour; next nine months, 73 cents an hour; a year or more, 75 cents an hour.

For the year May 1, 1925, to April 30, 1926: First three months, 70 cents an hour; next nine months, 75 cents an hour; after one year, 77 cents an hour. The present rates of pay are 60 cents for the first three months, 65 cents for the next nine months and 67 cents for those employed a year or more. The present agreement between the company and the carmen expires April 30.

Estimate Board Approves Subway Extension

The Board of Estimate of New York City on April 4 approved a report of Arthur S. Tuttle, its chief engineer, recommending a route for a subway extension of the Fourteenth Street-Eastern subway, and rejected the route submitted by the Transit Commission.

The route approved is somewhat shorter than that submitted by the Transit Commission and was evolved by Mr. Tuttle and Edward Riegelmann, Borough President of Brooklyn. Mr. Tuttle reported that the chief engineer of the Transit Commission had agreed that the substitute route was feasible and it was said that the commission would probably approve it. The cost is estimated at about $14,000,000.

The extension is proposed as an underground line and will connect two units of the B.-M. T. system, joining the Fourteenth Street-Eastern subway at Meserole Street, Brooklyn, to the elevated system at East New York and spanning a distance of approximately 3 miles. The Transit Commission advocated a similar extension with a large part of the line elevated.

The company's estimate of additional wages to be paid amounts to $1,638,000.

Foreign News

Swiss Electrification in 1924

The Swiss Federal Railways construction program for the current year, totaling 72,342,550 francs, provides for a substantial amount of electrification. Conversion to this form of operation has been progressing for a number of years, until with the completion of this season's construction all but 260 miles will have been electrified. The program for electrification will be accelerated as much as possible this year, work having begun on the Lucerne-Basel, Thalweil-Richterswil, Zurich-Bern, Sion-Lausanne, Lausanne-Vallorbe-Yverdon lines, a total of 242 miles. The Renens-Geneva line is also on the program for this year.

P-L-M Electrification Progress

The Paris-Lyons-Mediterranean line is at present electrifying that portion of its main Franco-Italian section between Culoz (the junction for Bellegarde and Switzerland) and Bardonneche, Italy, via Modane and the Mont Cenis tunnel.

This portion of the line centers around the summer capital of Aix-les-Bains, and on to the Italian frontier. It is the most scenic length of railroad in France; that electric traction, observation and tourist cars should here be first tried out is not astonishing.

The work already would have been put through to Culoz but for the difficulties of the company in securing right of way for its transmission lines across certain private properties of this virtual mountain fastness. It finally was necessary to obtain from the government a public decree and authorization to expropriate the necessary rights. It is doubtful if electrical operation will begin this summer, as was hoped.

Paris Tramway Profit

The Eastern Paris Tramway Company (the unit of the "Transports en Commun" running eastward from the center of the city) announces a net profit of 3,181,931 francs for 1923. This is sensibly the same as for 1922. The company owes for material and supplies 6,754,189 francs, but has carried to reserve for the amortization of bonds the sum of 1,724,790 francs.

New Electric Lines for Upper Savoy, France

The governmental authorities of the French department of Haute Savoie have decided on the construction of electric car lines from Annecy to St. Julien and Annecy to Seyssel and also electrification of the line from Annemasse (the Swiss frontier station) to Samoens, with an ultimate extension as far as the village of Sixt. Another branch line will tap in midway on this latter route. On the Annecy-St. Julien line there will be a reinforced concrete bridge with a single arch of 150 m. crossing the River Usses at a height of 147 m.

Work has already begun. The railway construction will be in the hands of separate contractors from those who will build the 45,000-volt transmission lines to serve the railway and to provide light and power along the lines.

Glasgow Studying Subway Situation

Steps are being taken for improving the service, and ultimately of changing over the system from cable to electric traction, of the Glasgow Subway Railway, which recently was purchased by Glasgow Corporation.

The Tramways Committee is considering engineering and traffic reports made by city officials, and plans have been called for to provide improvements in the approaches to certain stations, and to install underground sidings where car repairs can be carried out. This work is all being planned with a view to the electrification of the system. It also was arranged that the waterproofing of the tunnels should be completed.

London Strike Settled

April 1 marked the end of the strike of London tramway employees and the sympathetic strike of London, the General Omnibus Company employees, which began March 22 and continued during the following week. The earlier events were described in this paper last week on page 558. The workmen stood out for an increase in wages of 8s. a week, which the employers said they could not afford to pay. After a few days the trade union representing railway locomotive drivers and firemen announced that unless a settlement was arrived at by March 28, they would call out their members employed on the underground railways and on the electric suburban lines of the main railway systems. By this time the Prime Minister and other members of the Government were taking an active part in the negotiations for a solution, on account of the seriousness of the situation. The Government announced that if the threatened extension of the strike took place the Emergency Powers Act would be brought into operation and everything possible done to maintain passenger transportation in London. On March 28, however, the representatives of the men agreed tentatively to a new offer made by the employers. This provided an immediate advance of 6s. per week for the uniformed men, that the war bonus part of wages should not be affected till the cost of living index figure dropped 8 points below 75, and that wages should be further increased by 1s. for each rise of 4 points. To grades other than the uniformed staff the offer was an increase of 4s. a week immediately and the other terms as above. These proposals were submitted to a vote of the men. The ballot was taken on March 31, and resulted in the acceptance of the terms by 9,428 votes against 4,377. The services of tramcars and buses were resumed next day.

Interurban Subway Proposed in France

The city engineer of Tourcoing, which with Roubaix and Lille forms a triumvirate of industrial cities with perhaps the most intense interurban traffic in France, has brought forward a project for a new line to connect Turcoing and Roubaix. The route would be underground for 4 or 5 miles, the remaining 6 or 8 miles being either at surface level or elevated. Traffic conditions have here become such that something of the sort was obviously demanded. Trains under a ten-minute headway were proposed to supplement the present tramway services, which are said to be about the best of their kind today in France, even though in the reconstructed, invaded regions.

The proposition provided for an extension at some future time in the form of a belt subway linking the three industrial cities and the intermediate villages, with double tracks and trains running in both directions.

Continuation of Weekly Pass Recommended.—The manager of the Bradford Corporation Tramways has recommended a continuation of the weekly pass system, which has been under trial. This has caused a certain amount of local criticism, as it is averred that business houses are gaining an advantage by purchasing bundles of passes for their employees. It is also said that the post office is saving £150 a week, as passes have been supplied for the postmen, who may use the pass as often as twenty-five times a day.

Bordeaux Tram and Omnibus Profits Off.—The annual report for 1923 of the Tramways Electriques et Omnibus de Bordeaux shows a net profit of 2,267,844 francs, as compared with 2,578,627 in 1922. The section within the city limits brought in 1,889,052 francs of the total and the suburban lines the remainder.

Assets Turned Over to New Company.—At a general meeting of the Belgian company which owns the Ottoman Tramways and Electricity Company of Beirut, a concession of Syria, now under French mandate, the conditions were fixed upon which the company assets will be turned over to the new French company. The French company will pay 6,000,000 French francs to the Belgian company, which will retire the Belgian stock and bonds by exchanging for those of the French company to the value above set forth. The stock carries 7 per cent and the bonds 4½ per cent interest.

Tube Railway Proposed for Manchester.—The Manchester, England, City Council has appointed a committee to consider the desirableness and feasibility of an underground electric railway running beneath the main arteries of the city and suburbs, and to investigate the probable cost.

Financial and Corporate

Pittsburgh Receivers Report

File Final Accounting Covering Their Stewardship for Period Since 1917

The receivers of the Pittsburgh Railways have filed a final accounting in the affairs of the Pittsburgh Railways during the last six years. A feature of the report, which summarizes the six years' work, is that receipts from fares in 1923 increased almost 70 per cent over the amount in 1917, the year preceding the receivership.

The receivers handled $118,606,987 in fares, improved equipment at least 50 per cent and, about two months ago, turned back the property to its owners in good condition, with more than $3,000,000 in free cash.

The receipts of the company, as outlined by the receivers, by years follows:

1917	$13,551,135
1918	14,192,065
1919	16,628,936
1920	21,494,795
1921	21,731,944
1922	21,580,464
1923	22,978,783

With one exception, 1922, each year under the receivership has shown an increase in receipts over the previous years.

The cash in the hands of the receivers on Jan. 31, when the company was turned back to its owners, the report discloses, was $3,282,715, and the accounting adds:

> Against this sum there were outstanding the current bills and monthly payrolls due on that date, and which were assumed by the corporate company.

The seven years' receipts recorded cover also a period in which the fare went from 5 cents to the present 8⅓ cents, or three tokens for a quarter. In 1918, when the fare was increased from 5 cents to 5½ cents and then to 5 and 7 cents, or zone fares, the receipts jumped more than $600,000; in 1919, when in July the fare was raised to 7½ cents, or four tickets for 30 cents, receipts increased about $1,500,000; in 1920, when in September the fare was raised to the present 8⅓ cents, receipts increased nearly $3,000,000. In 1922, receipts dropped about $150,000. This decrease was attributed to industrial depression, for in 1923, fare receipts increased again another $1,500,000, reaching $22,978,783, the highest figure ever recorded in the history of the Pittsburgh company.

Then the receivers' accounting goes into what they have attempted in the way of rehabilitating the property. Buying for cash, they point out, they purchased, first twenty-five new cars, then forty, then twelve, then fifty-five cars, with an option for twenty more, or a total of 152 new cars.

The accounting continues:

> Earnest and continued efforts were made to comply as near as was possible with the recommendations of the commission. Maintenance of way and structures expenditures were increased from $1,394,540 in 1918 to $3,410,489 in 1923, and the amount of new track laid during each of the past four years was: 31.34 miles in 1920, 23.7 miles in 1921, 45,84 miles in 1922 and 41.83 miles in 1923.
>
> During the period of the receivership a total of nearly $600,000 has been expended on repairs and reconstruction of bridges.
>
> It is of interest to note that of the various items of work formally demanded in petitions to the court, by the city of Pittsburgh and other municipalities, while each could not be undertaken at the time of original presentation, practically all have been eventually performed and completed.
>
> In this connection earnest effort was made during the year 1923 and January, 1924, to bring to full completion and conclusion every one of the possible 263 items of work in progress during 1923, with the result that the accounts were closed on all but fourteen.

Stabilizing Fund Shows Profit in March

March operations of the Community Traction Company, Toledo, resulted in a profit of $2,617 for the stabilizing fund after all charges under the Milner ordinance were made. A heavy maintenance was set up for the month to take care of track repairs during the summer months. This added about $15,000 to the expense as compared with a year ago. In March this year the maintenance set-up was $70,000.

Gross revenue for the month was $374,723 and operating and maintenance expense $307,025. This left net earnings from operations of $67,698 for the payment of capital charges, depreciation, sinking fund and other fixed charges. After these the net to the stabilizing fund was $2,617. The number of revenue passengers carried was 5,415,974 in March as compared with 5,813,634 for the same month a year ago.

Due to increased fare, however, there was an increase of 5.3 per cent in revenue. Total passenger revenue was $349,953 this March as compared with $331,180 a year ago. Decrease in riding is attributable in part to greater use of private automobiles and a slight tendency for industry to slacken in March.

Toledo & Western Operates Under New Management

The old Toledo & Western Railroad, Toledo, Ohio, was taken over by a new company on April 1 with its one-time receiver, Albert Swartz, in complete charge of operations. The road was purchased from Frank R. Coates of Henry L. Doherty & Company by the Willys-Overland Company and the Wabash Railway about a month ago.

The Ohio Public Utilities Commission has authorized the purchase of the road for $200,000 and the issuance of $500,000 of common stock of the Toledo & Western Railway, as the successor company will be known. It is understood that work on improvements at the Toledo terminals will be under way in a few weeks. A new right-of-way and land development for factories and home sites will be part of the plan.

$150,532 Loss in Providence

Earnings Affected by Unusually Severe Winter and Unavoidable Delay in Putting in Economies

The total revenue of the United Electric Railways, Providence, R. I., for the year ended Dec. 31, 1923, was $8,104,043. The net loss from operation for the year, after deducting all operating expenses, interest, taxes, depreciation, etc., was $150,532. As the company is subject to the jurisdiction of the Interstate Commerce Commission and is required to keep its accounts in conformity with the methods prescribed by the commission, the difference in the amount of the net loss from operation for the year as shown by the auditor's statement and the amount of the net loss of $69,501 shown by the company's report filed with the Rhode Island Public Utilities Commission is explained by the treatment of certain items during the year to conform to the requirements of the Interstate Commerce Commission.

On Dec. 24, 1923, the Public Utilities Commission of Rhode Island entered an order approving the issue of $1,455,000 par value, prior lien mortgage, twenty-five year, 6 per cent gold bonds, Series C, and $624,200, par value, common capital stock to be applied to reimburse the company for cash expended for extensions, betterments, improvements and the acquisition of new property in the amount of $2,079,227. Conditions being unfavorable to the advantageous marketing of the company's securities on Dec. 31, 1923, only $450,000 par value of Series C, prior lien mortgage bonds had been nominally issued, and these were pledged to secure notes for loans necessary to furnish money for the company's immediate needs. The company explains that when improved conditions permit the sale of these bonds to advantage, the proceeds will be available for further additions and betterments to the company's property as may be required.

During the year 1923 dividends were declared and paid amounting to $206,267, the last dividend payment having been made July 2, 1923.

CONDENSED INCOME AND SURPLUS ACCOUNT OF UNITED ELECTRIC RAILWAYS FOR YEAR ENDED DEC. 31, 1923

Total revenue from all sources	....	$8,104,043
Operating expenses	$6,499,299	
Depreciation	736,316	
Taxes	341,618	
Bond interest and other deductions from income	677,342	8,254,575
Net loss from operations for the year	....	$150,532
Less: Miscellaneous adjustments of prior years' expenses	....	120,072
Deducted from surplus	....	$30,459
SURPLUS ACCOUNT		
Balance Jan. 1, 1923	....	$1,747,457
		$1,716,998
Less: Dividends paid	$206,267	
Paid to bondholders in consideration of reduced rate on P. L. bonds, Series A	45,040	251,307
Surplus Dec. 31, 1923		$1,465,690

In September, 1922, an announcement was made that a reduction in fares would become effective Jan. 1, 1923, by the sale of ten tickets for 50 cents with a 6-cent cash fare. Labor and material prices began to rise, however, and this, with the severe winter conditions, unavoidable delays in receiving new cars and power station equipment and other adverse conditions, brought about a situation which made necessary the passing of further dividends in 1923.

On Nov. 22, 1923, the company filed with the Public Utilities Commission a new tariff providing for the sale of nine tickets for 50 cents instead of ten, this tariff to become effective on the thirty days' notice required by law. On Dec. 24, 1923, this new rate of fare became effective. It is expected that this change will increase the revenue of the company $422,000 annually.

The new rate of fare will not, however, produce sufficient revenue to meet the cost of service, including in the term "cost of service," in addition to operating expenses, depreciation and fixed charges, the payment of 6 per cent on capital, which is as much a part of the cost of service as the payment of wages to labor. In consequence, application will be made for a rate of fare sufficient to meet the cost of service.

During the year 1923 the company placed under one-man operation sixteen of its lines, making a total of twenty-eight lines now under one-man operation. During the morning and evening rush hours, however, these cars are operated by two men.

During 1922 the company operated 1,781,641 passenger car-miles more than were operated in 1921, or an increase in service of approximately 13 per cent. During 1923, the company operated 16,783,773 passenger car-miles, an increase of 1,129,475 over 1922, or 7.2 per cent, and an increase over 1921 of 2,911,117 miles, or 21 per cent. The term "car-miles" includes passenger and bus miles.

During the year 1922, 126,209,026 revenue passengers were carried. In 1923, 138,578,286 revenue passengers were carried, an increase of 12,369,260 over 1922, or 9.8 per cent.

$42,166 Balance in London, Ont.

The net income balance for the year ended Dec. 31, 1923, of the London Street Railway, London, Ont., amounted to $42,166. The gross earnings were $693,411, of which $685,608 was from passengers alone. The total operating expenses were $572,082. Compared with 1922 the gross earnings showed an increase of $98,827 and the operating expenses also increased $77,096.

In his annual report, President Charles Currie referred to the company's loss due to the competition of buses. He says that this condition was eliminated in February of last year, when the city demanded from the bus operators reasonable protection for the public against accidents. Early in 1923 the company itself established a bus service for the distance of 1 mile, operating through a growing section.

He refers to the question of municipal ownership being taken up by the City Council during the latter part of 1923. He says that after considerable negotiations the company and the city were unable to agree on a price to be submitted to the voters, and that as a result the Council did not submit the question to a vote of the people at the regular election held in December.

Seeks Issue Approval

Birmingham Electric Company Wants to Float $8,000,000 in Securities—Tidewater Sale April 15

The Birmingham Electric Company, which company recently purchased the properties of the Birmingham Railway, Light & Power Company, at Birmingham, Ala., filed application April 5 with the Alabama Public Service Commission, at Montgomery, for approval of the issuance of $8,000,000 securities and the transfer of the old Birmingham Railway, Light & Power Company to the Birmingham Electric Company. The commission set April 16 for the hearing of these applications.

The application for the transfer of the old Birmingham Railway, Light & Power Company to the Birmingham Electric Company states, among other things, that as a result of the reorganization more than $5,000,000 of securities and obligations of the Birmingham Railway, Light & Power Company, including its $3,500,000 of preferred stock, will be eliminated from securities senior to the new company's stock and become part of the equity represented by the common stock.

A second application is for the approval of the issuance of securities by the Birmingham Electric Company, which include $8,000,000 of 6 per cent bonds to be due in 1954, 20,000 shares of no par value preferred stock entitled to a dividend of $7 a share each year, and on any distribution of assets entitled to payment of $100 a share, or a total of $2,000,000, and an issue of no par value of common stock to represent the equity in the property.

It is stated that substantially the entire proceeds of the new bonds are required for payment of existing 5 per cent first mortgage bonds and 6 per cent refunding and extension mortgage bonds of the old Birmingham Railway, Light & Power Company, and the payment of claims filed in the receivership proceedings against the Birmingham Railway, Light & Power Company.

Up to the present time there are no inquiries as to the sale of the Tidewater line, which is advertised to take place at public auction about April 15. There were no bidders at the two former sales. The Birmingham Railway, Light & Power Company operated the Tidewater for some time past, but its successor is under no obligations to continue to operate the line. Officials say the Tidewater line has one of two things in store for it—rearrangement on an economic basis or the junk pile.

The Tidewater line is about 14 miles in length. It operates from East Lake to Ensley. Several miles of the trackage of this line is operated through territory not yet developed. Moreover, the Birmingham Railway, Light & Power Company has been operating two lines to Ensley.

Chelsea Leasing Bill Likely to Pass

The committees on street railways and metropolitan affairs of the Massachusetts Legislature has voted to report the bill to the Legislature for the state to take the Chelsea division of the Eastern Massachusetts Street Railway and then lease it to the Boston Elevated Railway.

Under the terms of the bill the Eastern Massachusetts will receive $3,000,000 for the property located in Boston, Chelsea, Revere, Malden and Everett, and of this sum the Elevated will eventually pay $2,000,000 and the communities which are benefited will pay $1,000,000, to be apportioned in a conference of their representatives.

The measure as drafted has the approval of the two roads and of the city of Boston. It is regarded as the most important step taken in the Massachusetts Legislature in many years toward the solution of a difficult transportation problem, affecting particularly Chelsea and Revere. It will mean the extension of through service and a 10-cent fare to those communities, including Revere Beach.

Mayor Curley of Boston believes that the change will cost the city of Boston about $10,000 annually, but he is wholeheartedly in favor of it. He contends that it even will facilitate the movement for a Greater Boston by the merging of the independent municipalities. The proposition has had such smooth sailing this year in the Legislature that the prospects of its enactment into law are good.

St. Louis Details Not Yet Arranged

A member of the committee which is working on the plan for the reorganization of the United Railways, St. Louis, Mo., said on April 8 that although no fixed plan could be announced, the agreement contemplates that the $30,000,000 outstanding general mortgage 4s, due in 1934, will remain outstanding, as the committee has been advised by counsel that there will be no permanent default in these bonds if certain legal requirements are met.

These bonds, it was said, are technically in default because of the default in about $6,000,000 of the underlying bonds which matured last year. Necessarily the receiver's certificates, the underlying bonds and other temporary or past due obligations will be provided for, the plan being largely confined to the St. Louis Transit Company 5s, of which $9,790,000 are outstanding, the St. Louis & Suburban Railway general 5s, and to the preferred and common stocks.

The plan also contemplates the conversion of the $9,790,000 Transit 5s which mature next October into preferred shares of the same amount, thus reducing the bonded indebtedness of the company, and proposes the conversion of the present preferred stock into common shares of no par value, thereby reducing the charge for dividends.

The immediate undertakings of the committee will be to determine, with the Public Service Commission, a proper valuation of the properties, and then to arrange for a new franchise "which will insure proper service and protection to the car-riding public."

The committee which has evolved the tentative plan for ending the five-year receivership consists of F. O. Watts, president First National Bank of St. Louis; William P. Gest, president Fidelity Trust Company of Philadelphia; J. K. Newman, president Newman, Saunders & Company, Inc., New Orleans and New York; A. L. Shapleigh, president United Railways, St. Louis, and J. Shephard Smith, vice-president Mississippi Valley Trust Company, St. Louis. Newman, Saunders & Company are the agents appointed by the committee to assist in carrying out the plan. The firm will establish offices in St. Louis.

Suit has been filed by attorneys for bondholders of the St. Louis & Suburban Railway asking for the appointment of a separate receiver and a separate valuation by the Missouri Public Service Commission. The decision to bring suit is said to have grown out of dissatisfaction by representatives of the bondholders with the terms proposed to be extended to them for participation in the reorganization of the system.

Foreclosure action under a mortgage securing $2,000,000 of the Suburban bonds is now pending in the federal court. These bonds are secured mainly by the downtown loop of the Hodiamont division. An additional issue of Suburban bonds is also in default, but foreclosure proceedings have not been instituted.

The United Railways and Receiver Wells have denied the allegations set forth in the new Suburban petition. The answer of the attorneys for the United Railways specifically denied that the Hodiamont division of the Suburban owned the downtown loop.

City Counselor Senti of St. Louis has announced that the city will oppose all attempts to separate the two systems. The city's petition will be oral.

Indiana Interurban Suffers Loss of $179,824 in 1923

The Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., shows in its annual report for 1923, filed with the Public Service Commission, that it had a deficit in gross income of $11,500. In other words, operating expenses, taxes and depreciation amounted to more than revenues. The deficit for the year was $179,824, after charging interest on debt and an amortization item against gross income.

Passenger revenue for the year was $369,623, or $41,806 less than for 1922. Total operating revenues were $583,859, or $43,903 less than for 1922. Operating expenses were cut down $21,905 as compared with 1922, the operating expenses for 1923 being $562,403. Operating revenues were $21,456 more than operating expenses, including depreciation. Taxes were $34,437. This resulted in a loss in operating income of $12,981. The non-operating income was $1,481.

The report shows that $119,950 interest on bonds accrued during the year and that $45,275 interest on bonds was paid.

Economist Testifies on Values

Johns Hopkins Expert, in Buffalo Case, Sees Continuation of Present Price Level for Five Years

Testimony on behalf of the International Railway, Buffalo, N. Y., in the valuation case was given by Dr. Jacob H. Hollander, professor of political economy in Johns Hopkins University, before the Public Service Commission of New York on March 25. Dr. Hollander's testimony dealt with the factors affecting the general price level and the probable future price level. In his testimony Dr. Hollander stated that there were two possible ways of discussing the probable trend of prices during the next five years. One he described as "Historical Parallel" and the other "The Method of Analyzing as to Cause."

Historical Parallel Method Fallacious

With respect to the method of "Historical Parallel," Dr. Hollander stated that the defect in it is that the historical parallel is meaningless unless it can be established that the same conditions operated or will operate in each successive case. He contrasted the situation after the War of 1812 and after the Civil War with the situation after the World War, pointing out that the two powerful causes for the decrease in prices after the two previous wars had been the return to a gold standard and the scarcity of gold, neither of which causes was present after the World War, as the United States had always maintained specie payments and the country was not threatened with a gold famine, but with a gold plethora. The historical analogy, the doctor stated, fails not only in that the causes which operated after the two early wars are not present after this war, but exactly the converse obtains.

In continuing his testimony, the doctor stated that the tendency, therefore, is to discredit the historical analogy method and turn to the other, or analytical method, which is practically ascertaining what factors influence prices and what may be expected as to those factors.

Dr. Hollander stated the two factors that influence prices are the amount of goods and the amount of money. By means of graphic charts the doctor demonstrated that the industry of the country is operating on a scale unparalleled in our national history and that the basic industries of the country are exceeding the war peak in their volume of production. From this he concluded that if there should be any drop in prices it will not be because of enormous increase in the volume of production.

With respect to any change in the volume of money, money in the business sense meaning the volume of credit, the doctor after explaining charts showing the position of the Federal Reserve system and explaining the Federal Reserve ratio had increased from 40 per cent in 1920 to 80 per cent at the present time, stated that the country was in a situation in which it was practically deluged with gold, and the possibility of utilizing that increased gold structure for the expansion of credit is so apparent that it makes conservative banking a good deal of a resistance to popular demand from those classes of the community who call for rising prices.

The analytical method, the doctor explained, proceeds on the theory that opinion as to the course of prices is simply trivial unless it is based upon the conclusion drawn from the forces which determine prices. These forces are the volume of trade and the amount of credit. As to the volume of trade, affairs have reached the point where maximum production is in sight. As to the volume of currency, matters are in the position where banking policy and conservative administration are called into play to prevent that expansion which would be the natural consequence of an accumulation of gold. It is a reasonable conclusion, confirmed by the developments of the last year, that banking policy, in so far as it is subject to control, will be in the direction of encouraging price stability and that a period of five years may be expected in which prices are likely to hover approximately around 150, where they have been for the last twelve months.

In reply to the question, "Is the use of the historical analogy for predicting future prices based on anything more than supposition?" the doctor stated:

> I think it is not entitled even to be described as supposition. It enjoys no recommendation whatsoever, anything more than it would be to say that because two things look alike, therefore they are alike. To base a conclusion as to what will happen after the third peak upon what happened after the two earlier peaks, without ascertaining whether like conditions prevail, is certainly an uncharted flight into the realms of fancy.

Receiver Appointed for Isle of Palms Company

Perroneau R. Rivers, Charleston, S. C., has been appointed receiver of the Charleston Isle of Palms Traction Company, by order of Judge H. A. M. Smith, in federal court upon petition of the Baltimore Trust Company, Baltimore, Md., trustee under the indenture securing $250,000 of 5 per cent bonds. The sheriff of Charleston County, on Feb. 21, seized the ferryboats and cars of the company, under attachment proceedings. He was ordered to show cause why he should not be restrained from proceeding to advertise and sell that portion of the property which he seized.

No resumption of operations of ferry and car service is contemplated. Meanwhile a public ferry and bridge service has been provided for in a bill passed by the General Assembly to take the place of service formerly run by the company.

The company was incorporated under the laws of South Carolina on Jan. 9, 1913. It took over the Seashore Division of the Charleston Consolidated Railway & Lighting Company, a line of 10 miles, extending from Mount Pleasant to Sullivan's Island and Isle of Palms, with its equipment and powerhouse on Sullivan's Island. Mount Pleasant and Charleston are connected by ferry by the company by means of two ferryboats.

Kansas Merger Completed

The Topeka Railway & Light Company, Topeka, Kan., has changed its name to the Kansas Public Service Company and taken title to the property of the Atchison Railway, Light & Power Company and the Wichita Railway & Light Company. It will, as formerly, own all the stock of the Topeka Edison Company and the Topeka Railway, and in addition purchase all the common stock of the Kansas Power & Light Company.

New companies have been formed to be known as the Kansas Public Service Company and the Kansas Power & Light Company. Their formation was effected around the Topeka Railway & Light Company, which was the holding company and owned all the stock of the Topeka Edison Company and the Topeka Railway. The Illinois Power & Light Corporation owned all of the stock of the Topeka Railway & Light Company, also the Atchison Railway, Light & Power Company and the Wichita Railway & Light Company.

The Kansas Power & Light Company has been formed primarily to build a new power plant at Tecumseh and transmission lines in Kansas, among them the line from Topeka to Atchison.

Officers of the Kansas Public Service Company are: Clement Studebaker, Jr., president; William A. Baehr, H. L. Hanley, vice-presidents; Scott Brown, vice-president and secretary; George M. Mattis, treasurer, and Edward Woodman, clerk.

Brief mention of the intended merger was made in the ELECTRIC RAILWAY JOURNAL for March 22, page 484.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

Prior Preference Stock Offered.—A new issue of $7,500,000 Standard Gas & Electric Company, Chicago, Ill., 7 per cent prior preference stock is being offered by H. M. Byllesby & Company, Janney & Company, Hambleton & Company and the Federal Securities Corporation. The stock is priced at 93½, to yield approximately 7.50 per cent. The new financing is part of the plan to retire secured funded debt.

Reorganization Agreement Reached.—The committee representing the refunding 5 per cent, thirty-year gold bonds of the Buffalo & Lake Erie Traction Company, Erie, Pa., amounting to $7,066,000, notified the holders of these bonds and deposit certificates recently that a plan and agreement for the reorganization of the company have been reached. Alvin W. Krech is chairman of the committee.

Gold Debentures Offered.—A syndicate including Halsey Stuart & Company is offering at 99 and interest, yielding 6⅞ per cent, $3,500,000 of the West Penn Railways three-year 6½ per cent gold debentures due April 1, 1927. The railway part of the West Penn system, largely interurban, is located in the Pittsburgh industrial district of southwestern Pennsylvania and in West Virginia.

Stock Issue Approved.—The Public Utilities Commission has authorized the Central Maine Power Company, Rockland, Me., to issue and sell at not less than par 2,310 shares of its 7 per cent preferred capital stock of the par value of $100 each. The proceeds of the sale are to be used to reimburse its treasury and discharge indebtedness incurred by its payment of the sum of $231,000 for the retirement of 2,310 shares of the preferred stock of the Androscoggin Corporation.

Attempts to Keep Line Operating Fail. — Several attempts have been made, since the Connecticut Valley Street Railway shut down, to keep the line in operation between Northampton and Hatfield, Mass., but all efforts have failed. It is said that the road between Northampton and Amherst may be purchased by the Northampton Street Railway.

Bonds Offered to Yield 5.75 per Cent.—The Paine-Webber Company, New York, and R. L. Day & Company, Boston, are offering for subscription at 102 and accrued interest to yield 5.75 per cent $550,000 of Holyoke Street Railway first mortgage 6 per cent gold bonds dated April 1, 1915, and due April 1, 1935. It is explained that since 1919 net earnings prior to depreciation in each year have been more than three times the interest requirments on the entire funded debt, including this issue. During this period the amount charged to maintenance and depreciation in each year has been more than 23 per cent of the total revenue. Dividends are being paid at the rate of 6 per cent per annum on the capital stock.

Railway Buys Light Company.—The Indiana Public Service Commission has approved the sale of the Geneva Light & Power Company to the Marion & Bluffton Traction Company. The purchase price is $65,000, of which $50,000 is payable in cash and the remaining $15,000 in bonds of the Bluffton-Marion line. The property just purchased furnishes light and power to Vera Cruz, Craigville, Linn Grove, Berne and Geneva in Indiana and Chattanooga, Ohio.

Want to Issue Bonds for Improvements.—The Columbus Railway, Power & Light Company, Columbus, Ohio, has filed an application with the State Utilities Commission for authority to issue $2,250,000 in bonds, the proceeds to be used to reimburse the company for capital expenditures for further extensions and improvements. The application cites that between Oct. 1, 1921, and Feb. 29, 1924, the company paid out of its treasury a total of $4,750,565, none of the amount covered by the issuance of bonds, stocks, notes or other indebtedness securities. The railway department benefited in the expenditures to the extent of $1,571,545, while $1,501,336 went to the power, light and heat department for transmission, storage and distribution equipment. Land, structures and equipment consumed the remainder of the amount, it is shown.

Preferred Stock Offered.—A syndicate including A. E. Fitkin & Company, New York, is offering $1,250,000 of the Jersey Central Power & Light Corporation's 7 per cent cumulative participating preferred stock at 92½ per share and accrued dividends to yield more than 7½ per cent. The proceeds from the present financing will be used to acquire the stock of the Consolidated Gas Company of New Jersey and the Tri-County Electric Company and the balance for other corporate purposes, including additions and betterments to the properties. In addition to its operations in New Jersey the Jersey Central Power & Light Corporation controls the Tide Water Power Company, which owns and operates the entire electric light and power, gas and electric railway business in Wilmington, N. C., and suburbs and other light and power properties in Florida.

Local Service Abandoned in Temple.—Street car service in Temple, Tex., which has been maintained for the last nineteen years by the Belton-Temple Traction Company, has been practically abandoned since the new owners took over the interurban line between Belton and Temple. Service has been abandoned altogether in the northern part of the city, and the line serving South Temple has been shortened and several cars taken off. It was said by the new owners that the local service was a losing proposition and that it could not be maintained. The City Commissioners assented to the abandonment of the service. Tracks of the abandoned lines are being taken up.

Accumulated Deficit $326,270.—The Sacramento Northern Railroad, operating in Sacramento, Chico, Colusa, Woodland and vicinity, reports to the California Railroad Commission for the year 1923 that its operating revenue was $1,592,247; operating expenses $1,361,466, giving a net operating revenue of $230,781. Interest, rent, taxes and other deductions totaled $344,484. The corporate loss for the year was $79,561. The deficit at the beginning of the year amounted to $203,420. Miscellaneous additions to surplus for 1923 amounted to $4,587 and miscellaneous deductions were $47,876, leaving an accumulated deficit at the end of the year of $326,270.

New York City Tractions Offer Investment Opportunities.—William Carnegie Ewen, who has specialized for many years in New York City traction securities, has prepared a frank discussion and a general forecast of the local situation which he calls: "What's Ahead for the New York Tractions." He discussed the present political situation and reviews briefly the terms of the existing rapid transit contracts and then concludes: "Viewed from every angle, only one conclusion may be drawn—that the traction companies are on the eve of a period of great prosperity. As time goes on, their strong strategic position will be realized more and more by investors, and as a result we look forward with confidence to a steady appreciation in the value of those traction issues which have an adequate degree of security behind them."

Must Pay Increased Taxes. — The New Jersey Supreme Court has handed down an opinion in the franchise tax case of the city of Phillipsburg, N. J., against the Phillipsburg Transit Company, affirming the contention of the town. This means that the transit company will have to pay increased franchise taxes. In February, 1922, the city complained to the State Tax Board that the return of gross receipts made by the transit company was incomplete and did not show all of the gross receipts. The city wanted a return for the assessment of the franchise tax, based on the gross receipts from passengers carried in New Jersey and also in Easton, Pa. It is said that fares collected in Pennsylvania were not reported. The state board entered judgment and the Supreme Court upholds the decision.

Unusual Pamphlet Tells Earnings Story.—For the year ended Dec. 31, 1923, the Middle West Utilities Company, Chicago, Ill., a holding company for more than twenty subsidiary companies on which several hundred communities are dependent, reports a net income of $2,742,706. The surplus as of Dec. 31, 1923, was $2,064,417. These facts are contained in the annual report, which is an unusual pamphlet from the point of view of picture display and interesting data contained in its pages. Besides explaining the status of the physical properties involved the booklet describes in detail the company's activities during the year just ended in the matter of customer ownership, employees' life insurance and public relations. Some instructive charts accompany the story of accomplishment. Many scenes depicting the company's doings in the various states it serves are reproduced. To show the plants geographically a map is included locating the various properties.

Legal Notes

FEDERAL COURTS—*Taxation of Property of Street Railways as Personal Property Held Legal.*

In 1919 the State tax commissioner of Washington, acting under a state law, assessed a street railway property as "personal property." As so much of the property consists of cars, tracks, poles, appliances, wires and power houses, such an assessment was upheld as legal. [Puget Sound Power & Light Co. vs. King County, 44 Sup. Ct., 261.]

CALIFORNIA—*Pedestrian Injured While Walking Around Dirt Pile Wrongfully on Street.*

A water company, in violation of ordinance, piled dirt on the street less than a foot from the car track, so that a person crossing the street had either to climb over the pile or skirt it along the track. While doing the latter in the dusk of the evening, a pedestrian was hit by a car. It was held that both water and railway company were negligent. [Hansen vs. Market Street Railway, 221 Pacific Rep., 955.]

INDIANA—*Duty to Keep Depot and Platforms Safe Not Extended to Premises Not Adapted to Invitee's Business.*

The ticket agent at a station was in the basement when a person stopped to buy a ticket and check his baggage. Not finding the agent, he walked out to the freight platform and fell off a point that was unguarded. The company was held not responsible. [Union Traction Co. of Indiana vs. Grohs, 142 Northeast Rep., 389.]

KANSAS—*Purchaser of Street Railway at Receiver's Sale Takes Property Subject to Franchise Liabilities as to Paving.*

A person who becomes the assignee of a purchaser at a receiver's sale of the property and franchise of a street railway company takes the property and franchise subject to all the terms and conditions imposed by the franchise, including the obligation to pave certain portions of the streets. Hence, a sheriff, under a tax warrant issued by the county treasurer to collect this tax, may sell any non-exempt property of the person or corporation holding the franchise. [Fort Scott Public Utilities Co. vs. Sheriff et al., 222 Pacific Rep., 93.]

MASSACHUSETTS — *Persons Stepping from Automobiles Must Use Care.*

In order to allow a guest riding in an automobile to get out and take the trolley, an automobile was stopped suddenly on the track just beyond a white pole. The automobile driver expected the car would stop at the pole, but it did not and struck the automobile, injuring the person alighting. The court held that in these circumstances the person injured was guilty of contributory negligence. [Will vs. Boston Elevated Railway, 142 Northeast Rep., 44.]

MICHIGAN—*Words "Public Convenience and Necessity," as Applied to Motor Vehicles, Include Them Only.*

This case arose through a writ of certiorari by the Rapid Railway Company against the Michigan Public Utilities Commission to review an order granting a permit to the Wolverine Transit Company to operate a bus business between Detroit and Mount Clemens. The act under which the commission granted this permit declares that bus permits must be obtained from the commission and "said permit shall be issued in accordance with the public convenience and necessity." The majority of the commission held that the language of this section limited the inquiry to "whether a public convenience and necessity exists as to the motor vehicle business," but the Rapid Railway Company contended that all means of transportation between the points to be served must be considered. The court held, however, that this is not the case, partly because there is no reference in the act to indicate the Legislature had in mind the protection of existing railroad transportation interests, partly because the history of the bill in its passage does not indicate any such intention and partly because the purpose of the bill as declared in its title was to regulate the use of motor vehicles on the highways. [Rapid Ry. et al. vs. Michigan Public Utilities Commission, 196 N. W. Rep., 518.]

NEW YORK—*Consent of City Held to Embrace Consent to Spur in Front of Lots.*

Where a franchise is given to operate a railroad on certain streets, and it is reasonably necessary to construct a spur on an intersecting street in order to connect with a carhouse, it may be so laid if no suitable site for the carhouse can be found along the route. [Westchester Electric Railway vs. City of Mount Vernon et al., 142 Northeast Rep., 585.]

NEW YORK—*Lease and Modification, When Approved by Two-thirds of Stock, Held Binding.*

Under Railroad Law, Sec. 148, a railroad is authorized to lease its property, and this lease becomes binding when approved by the owners of two-thirds of the stock of each corporation. Though the statute is silent as to how such a lease may be modified, it is a fair implication that it may be modified in the same manner. Hence, a provision of a railroad lease that the lessee's guaranty of 7 per cent dividends as rent to lessor's stockholders could not be reduced without the unanimous consent of lessor's stockholders was held to be illegal, as attempting to set up a different agency for the modification of such lease than that established by the law, as mentioned above, and the guaranty did not survive a valid modification of the lease, made as outlined above. [Peabody vs. Interborough Rapid Transit Co., 202 New York Sup. (Sup. Ct.), 287.]

OKLAHOMA—*Injury to Leaving Passenger from Car Overhang on Curve.*

When a passenger is discharged from a street car at a regular stopping point, he should have a reasonable opportunity to get beyond danger from the movement of the car. The railway company is not bound to warn a pedestrian that he may be struck by the overhang on a car in rounding a curve, since that is a matter of common knowledge, but if the pedestrian is a passenger who has just left the car, the condition is different. [Trail vs. Tulsa Street Railway, 222 Pacific Rep., 950.]

WISCONSIN—*Commission May Permit Operation of One-Man Cars, Notwithstanding Municipal Ordinance.*

This was an action brought by the city of Milwaukee to set aside an order of the Railroad Commission authorizing the Milwaukee Northern Railway to install one-man cars in its local street railway in Milwaukee. The city of Milwaukee had passed an ordinance requiring all street cars to have a crew of not less than two men. The court held that as the Legislature was the creator of municipal powers, its authority was supreme in such matters, and that it had properly authorized the commission to exercise the power to investigate and decide what constitutes reasonable and adequate service. [City of Milwaukee vs. Railroad Commission of Wisconsin, 196 N. W. Rep., 853.]

Personal Items

Mr. Harvey Promoted

Assistant Manager of Toronto Transportation Commission Appointed to Succeed Mr. Couzens

D. W. Harvey has been appointed general manager of the Toronto Transportation Commission, operating more than 200 miles of electric railway formerly included in the system of the Toronto Railway, privately owned, and the Toronto Civic Railway. In that capacity he succeeds H. H. Couzens, who, as noted in the ELECTRIC RAILWAY JOURNAL for April 5, has joined the forces of the Brazilian Traction, Light & Power Company. He has been assistant manager at Toronto.

Mr. Harvey is not a difficult man to interview, but it is indeed very difficult to elicit any information from him about himself. Talk Toronto railways and he is at home. Hint at Harvey as a personage and he is silent. He can see nothing in his own life that should interest others. This is not mock modesty. The distressing thing about it is that Mr. Harvey is sincere in the humility which he shows toward the merits of his own accomplishments.

D. W. Harvey

As Mr. Harvey sees it, to borrow from Elmer Rice, his life has been free from marches and counter marches and any victory on a stupendous scale. About this judgment his associates disagree with him. They are reticent, however, because he is so modest about himself. They know it would be distasteful to him to sing his praises, but they insist upon the value of the performance of the man along the line of permanent, public accomplishments. Not the least of these is the ability—amounting at times almost to genius—which he displays in getting along with other men.

The man has many other merits. Because he had built solidly while with the old Civic Railway at Toronto, Mr. Harvey was made assistant to Mr. Couzens in the fall of 1921, when the lines of the Toronto Railway were taken over by the commission, and for similar reasons he has now been selected to succeed Mr. Couzens. It was logical that he should be. To them fell the task of rehabilitating the local Toronto lines, and the success they have attained—and it is real, definite success—is due in no small measure to the fact that they were permitted to work out the details in their own way and without political interference.

Mr. Harvey knows Toronto thoroughly. He knows its transportation needs. He really began to visualize them as long ago as 1911, when the first of the so-called civic lines was placed in operation. Of that line he was construction engineer. In 1912 the operation and maintenance were placed under his supervision, and in these capacities he continued until appointed to be assistant manager of the Toronto system in 1921, after the lines of the Toronto Railway had been acquired by the city. Mr. Harvey was born in London, Ont., on Feb. 24, 1887. He was graduated from Toronto University, and before entering railway work he was with the Ontario Power Company and the Toronto Structural Steel Company.

L. H. Palmer and S. E. Emmons Advanced at Baltimore

L. H. Palmer has been elected vice-president of the United Railways & Electric Company, Baltimore, Md., in addition to general manager, and S. E. Emmons has been appointed to the position of assistant general manager.

"Lou" Palmer, as he is familiarly known to his associates, has been general manager of the company since last March. At that time he succeeded in that position Herbert B. Flowers, who resigned to become president of the New Orleans Public Service, Inc. Before that Mr. Palmer had been assistant to the president at Baltimore since October, 1917.

Mr. Palmer is one of the best known men in the transportation side of the industry. He has been particularly active in association work. He was born in Chicago, but his business life has been spent in the East. He was graduated from Williams College in 1902, and then served with both the New York Central Railroad and the old Metropolitan Street Railway, New York. He has been connected with the company at Baltimore since 1915.

Mr. Emmons has been serving for the past two years as assistant to the general manager both under H. B. Flowers and his successor, Mr. Palmer. Previous to that Mr. Emmons had been in steam railway work. He came to the Baltimore company from the position of assistant chief engineer of the Ann Arbor Railroad. He had also served with the Pennsylvania Railroad and the Santa Fé. He was connected with H. E. Riggs on the Toledo valuation.

He was graduated from the University of Michigan, Engineering Department, and during the war was a captain of engineers in overseas service. Mr. Emmons is twenty-nine years old. He is a son of C. D. Emmons, president of the company.

Mr. Boylan Made Manager in New Jersey

M. R. Boylan, acting general manager of the Public Service Railway, Newark, N. J., since last December, has been elected vice-president and general manager. In that capacity he succeeds R. E. Danforth, recently resigned.

Mr. Boylan really established his reputation with the Public Service Corporation as an accountant. As such he has an uncanny capacity for digging quickly to the root of things. This ability he is said to have turned to extraordinary account since he has been handling railway matters, with the result that he has already established for himself a reputation in his conduct of the affairs of the railway both with respect to the economies that he has been able to work and in the direction of carrying out promptly policies decided upon by him for adoption.

M. R. Boylan

In short, Mr. Boylan has brought to the problems confronting the railway a new and detached point of view, but one that embodies an intimate knowledge of the history of the railway and a keen understanding of the point of view of the public. Mr. Boylan has been with the company since 1892. He is a native of New Jersey. His career was reviewed at length in the ELECTRIC RAILWAY JOURNAL for Dec. 1, 1923.

President Finlay Resigns from Montreal Company

William C. Finlay, president of the Montreal Tramways & Power Company, Ltd., Montreal, Que., and three fellow directors have resigned. The retiring directors are J. M. Wilson, George G. Foster and J. K. MacIntyre. Their departure leaves the board in full control of new officers elected at the last annual meeting.

C. N. Wilcoxon, president and general manager Chicago, Lake Shore & South Bend Railway, Michigan City, Ind., has resigned.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Philadelphia Company Buys American Locomotive Plant

Announcement was made recently by Arthur W. Thompson, president of the Philadelphia Company, of the purchase of the property and buildings of the American Locomotive Company in Preble and Island Avenues, Northside, Pittsburgh, locally known as Manchester. The price involved was $1,500,000. More than 11 acres are involved in the purchase, six of which are covered with brick and steel buildings of modern construction. The site adjoins the present Manchester carhouse and shops of the Pittsburgh Railways.

The property was acquired for the purpose of consolidating the storehouses of the various public utility properties of the Philadelphia Company, including railway, light, power and gas companies. The Manchester site will be the general storehouse of all these companies, and the office building on Preble Avenue formerly occupied by the administrative forces of the American Locomotive Company, will serve as the headquarters of the general storekeeper, who will operate under the supervision of the general purchasing agent of the Philadelphia Company and affiliated corporations.

New Import and Export Records Made in 1923

New records were made in 1923 in both the country's export and import trade, according to an analysis of American world trade made by the Foreign Commerce Department of the United States Chamber of Commerce.

Statistics of the quantity of logs and timber exported were made available first in 1912, when 664,000,000 b.ft. were exported, the record until the 1923 shipments of 752,000,000 b.ft.

Import records also were broken in 1923, principally in raw materials and partly manufactured goods for domestic industries. Crude rubber imports of 692,000,000 lb. in 1923 were 18,000,000 lb. larger than the 1922 receipts. The 1913 receipts of iron ore—2,595,000 tons—fell far below the 1923 imports of 2,768,000 tons. Imports last year of nearly 2,000,000,000 b.ft. of lumber were 400,000,000 b.ft. greater than in 1922.

For the first time since 1919 exports from the United States show an increase to every continent of the world. Every one of the country's ten leading customers bettered its 1922 purchases. These ten leaders, Great Britain, Canada, Germany, France, Japan, Cuba, Italy, Mexico, Australia and Argentina, take about 75 per cent of the total exports. A few important markets show smaller purchases. The declines in shipments to Belgium and India were so small as to be neglible. Practically all of the country's chief suppliers shipped the United States more goods in 1923 than in 1922, the only leaders showing declines being Japan and Switzerland.

Washington Is Hopeful

Prospects Ahead Brightened by Report of Commission of Experts—Situation at Home Is Good

Official circles in Washington see as the brightest spot in the economic sky the prospect for the solution of some of the European difficulties along the lines which are being suggested by the commission of experts. With a favorable turn in European affairs in immediate prospect, strong support for the wheat market is likely to develop. Since the stocks of all commodities in Europe have been held at a minimum, better prospects there would be reflected in the demand for American goods. While the immediate effect would be stimulating to the American market generally, the advance of stabilizing influences in Europe eventually will mean keener competition for foreign markets.

Domestically, industrial prosperity continues to rest on the super-activity of the construction industry. It is the balance wheel which is keeping things going. The public is demanding more room. The building program is going to be more extended than had been estimated. There is every evidence that it will be particularly active throughout 1924 and take up any slack in employment. It is the agricultural industry which is holding things back. A scrutiny of the index figures covering agricultural prices, however, indicates that it is coming closer and closer to the index numbers covering other commodities. Prices of manufactured goods are diminishing gradually as those of agricultural products are gradually rising.

Business as yet appears to be unaffected by the epidemic of investigations which are in progress on Capitol Hill. If there is indefinite continuation, however, of the furnishing of great pulpits from which the underworld is to be allowed to pour its vituperation, it is regarded as entirely within the range of possibility to undermine confidence to the extent that business will receive a jar. Thus far, however, it seems that the inherent sanity of the American people is standing them in good stead and they are not being carried off their feet. The government employs 600,000 persons in its service. Despite all the safeguards which are provided, it is humanly impossible to guarantee the probity of each one of the 600,000. Evidence taken in executive session is the buffer which stands between the community and those accused in the malicious statements. There is no thought, however, in the statements here set down of belittling the importance of certain disclosures which have grown out of the congressional investigations.

Metal, Coal and Material Prices

Metals—New York	April 8, 1924
Copper, electrolytic, cents per lb.	13.437
Copper wire base, cents per lb.	15.875
Lead, cents per lb.	8.60
Zinc, cents per lb.	6.575
Tin, Straits, cents per lb.	51.25
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.20
Somerset mine run, Boston, net tons	2.125
Pittsburgh mine run, Pittsburgh, net tons.	1.875
Franklin, Ill., screenings, Chicago, net tons	2.175
Central, Ill., screenings, Chicago, net tons.	1.675
Kansas screenings, Kansas City, net tons..	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.65
Weatherproof wire base, N.Y., cents per lb.	17.50
Cement, Chicago net prices, without bags.	$2.20
Linseed oil (5-bbl. lots) N. Y., per gal.	$0.93
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal.	$1.00

New Shops for Columbia Machine Works Are Progressing

Rapid progress is being made in the rebuilding of the shops of the Columbia Machine Works, Brooklyn, N. Y., which were recently destroyed by fire. A building of reinforced concrete, steel and brick is being erected which is 500 ft. long and 75 ft. wide. Part of this building is two stories and the south end one story high. The new structure extends along Chestnut Street, from Atlantic Avenue to Fulton Street, and will provide facilities for the blacksmith shop, machine shop and brass foundry.

At present work is being carried on in the buildings which were not damaged by fire, and while these facilities are sufficient to handle present orders, they are inadequate to meet the increasing demand for the company's products. The new shops will be equipped with the latest type of machine tools, which will assist in speeding up production and shorten delivery time. Five or six overhead traveling cranes will be provided in the new building. A 10-ton yard crane is now being erected for handling material in the yard and for loading and unloading cars. Part of the new building will be ready for occupancy in June, but it will require nearly a year to complete the entire work.

Chicago Surface Lines Seeks Bids for 100 Cars

Inquiries are being sent out by the Chicago Surface Lines for bids on the construction of 100 new double-truck arch-roof motor cars. They are to be equipped with two 65-hp. motors each and multiple-unit double-end control for operation as single cars or in trains. The doors on both sides of each vestibule will be pneumatically operated and arranged so that quick loading and unloading can be accomplished in street or subway operation. In either direction of operation the rear doors may be controlled by an operator on either platform or by a street collector. The exit door at each end will be of the new automatic type which was used on a group of forty-five one-man cars described in the ELECTRIC RAILWAY JOURNAL of Sept. 30, 1922.

The specifications are as follow:

Number of cars	100
Name of road	Chicago Surface Lines
Type of car	Multiple-unit, double-end
Total weight	38,000 lb.
Bolster centers, length	22 ft. 0 in.
Length over all	48 ft. 11 in.
Truck wheelbase	4 ft. 10 in.
Width over all	8 ft. 6 in.
Height, rail to trolley base	11 ft. 6 in.
Body	Semi-steel
Interior trim	Cherry
Headlining	¼-in. Agasote or $\frac{3}{16}$-in. plywood
Roof	Arch, ¼-in. plywood
Air brakes	Straight air with emergency feature
Signal bells and buzzers	Consolidated, or equal
Car trimmings	Bronze, statuary finish
Center and side bearings	Railway standard, plain
Conduits	Duratube or equal, and aluminum
Control	Multiple unit
Couplers	Automatic, with air jumpers for electric circuits
Curtain fixtures	Rex roller, fixtures to be approved
Curtain material	Double face
Destination signs	Hunter illuminated or equal
Door operating mechanism	National Pneumatic or equal with automatic exits
Wheelguards	H. B.
Hand brakes	Pittsburgh No. 35 or equal
Hand straps	Rico No. 7
Heater equipment	Consolidated cross seat or equal
Headlights	Railway standard pressed steel
Lightning arresters	M. D. or equal
Meters	Economy
Motors	2-65 hp. outside hung
Paint, varnish or enamel	Chicago varnish and Vitrolite enamel
Rails and stanchions	Aluminum
Registers	International R-7 or equal
Roofing Material	No. 8 National prepared roofing
Sanders	Electric Service No. 135-A or equal
Sash fixtures	O. M. Edwards or equal
Seats	Rattan full spring upholstered
Step treads	Kass or equal
Thermostat	Ry. Utility or equal
Trolley catchers	Ohio Brass or equal
Trolley base	U. S. 14 or equal
Trolley wheels	Railway standard
Trucks	Maximum traction
Ventilators	Railway Utility or equal
Wheels	Rolled Steel, 28 in.

Belgian Concern Active in Building Motors

The progress of the Ateliers de Constructions Electriques de Charleroi, Belgium, gives a striking illustration of the industrial recovery of Belgium. From a pre-war force of 800 men and 510 machine tools, this Charleroi manufacturing shop has increased to a personnel of 4,100 and 2,000 machine tools.

Among its various manufactures is a line of traction motors which constitute an important department of the concern. Subsequent to the war motors of 25 hp. at 500 volts have been manufactured, and more recently a 30 hp. size. As a matter of fact, Charleroi works as early as 1900 built a complete series of motors ranging from 20 to 225 hp., for a gage of 1,435 meters.

With the growth of tramway services and the general reduction of the gage to 1,000 meters, the Charleroi works developed a new series of motors more compact in design and comprising 50 hp. motors at 700 volts, equipped with four commutator poles. This type of motor now competes actively in Europe with American built motors.

The company is now engaged in developing a new series of motors with forced ventilation, with the idea of securing maximum power with minimum space and weight. All air holes are to be supplied with protecting screens against water and dust, which, it is said, can be so arranged as to give all the effect of an armored motor.

Rolling Stock

Pittsburgh Railways, Pittsburgh, Pa., has placed an order for 200 new cars.

Madison Railways, Madison, Wis., will purchase seven or eight new cars if the recommendations of the Wisconsin Railroad Commission are carried out.

New Orleans Public Service, Inc., New Orleans, La., will soon ask for bids on fifty-five cars.

Track and Line

Spokane United Railways, Spokane, Wash., will rebuild tracks on Riverside Avenue, between Lincoln Street and the Monoghan monument, with new rails and ties, set in solid concrete. The double curve that now exists will be removed and one long curve installed.

Kansas City Railways, Kansas City, Mo., has applied to Judge Stone for permission to extend its line on South Prospect Avenue to Fairyland Park and to rebuild various stretches of track at an expenditure of $500,000.

Wichita Railroad & Light Company, Wichita, Kansas, plans to extend the College Hill division from Roosevelt to Belmont, a distance of five blocks. Howard Patten, general manager, has estimated the cost of this improvement at $18,000. Construction of the extension will start soon.

New York, N. Y.—Contractors' bids for the construction of the main stem of the crosstown subway in Brooklyn, in Bedford Avenue from DeKalb Avenue to Keap Street, will be received by the Transit Commission on April 25. The commission unanimously selected April 25, on motion of Commissioner Harkness that the construction work be proceeded with forthwith. This will be the first of the construction contracts for the new lines, but the commission has already submitted to the Board of Estimate proposals for the making of test borings along Bedford Avenue and for the removal of the memorial trees along that thoroughfare.

Seattle Municipal Railway, Seattle, Wash., has started on its summer construction program, involving an expenditure of nearly $750,000, under supervision of A. E. Pierce, superintendent of maintenance. An order for 600 tons of heavy steel trackage, costing $420,000, has been placed by Mr. Pierce. The work involves renewal of special trackage at Second Avenue and Pike Streets; new cable crossings and foundations, costing $30,000, at Third Avenue and James Street, and Third Avenue and Madison Street. These jobs call for replacing present crossings, excavation of concrete bed, and building up steel and concrete foundation work 26 ft. square and 39 in. deep below the track level. Track renewals in various parts of the city, paving of three spur tracks and surface reconstruction and repaving between tracks complete the work. The largest single job will be the retracking of Westlake Avenue from Roy Street to the Fremont bridge, to cost $100,000.

The Nashville Railway & Light Company, Nashville, Tenn., will spend more than $600,000 in 1924 on its construction program. It is proposed to rebuild 12.58 miles of track, which it is estimated will cost $280,000.

Power Houses, Shops and Buildings

New Orleans Public Service, Inc., New Orleans, La., expects during the next month and a half to have the 20,000-kw. generator for the Market Street power station and three months after arrival it is expected to be in operation. The generator, condenser, switchboard and other appliances will cost $1,200,000.

Manchester Traction, Light & Power Company, Manchester, N. H., has awarded a contract to Stone & Webster, Inc., Boston, Mass., for the installation of vertical hydraulic turbine units of 2,400 and 3,200-kw. rating at its Garvins Falls station on the Merrimac River and of a vertical unit of 1,000-kw. rating at Kelly's Falls, on the Piscataquog River. The Kelly's Falls plant will be equipped with full automatic control, with additional provision for supervisory control from the company's adjacent steam plant.

Trade Notes

H. E. Pratt, formerly vice-president of Babcock & Wilcox Company, New York, N. Y., has been elected president of the company, succeeding W. B. Hoxie, who becomes vice-chairman. E. H. Wells remains chairman. Isaac Harter, general superintendent, succeeds Mr. Pratt as vice-president.

Quigley Furnace Specialties Company, New York, N. Y., will move its Chicago office to larger quarters, on May 1, at 9 South Clinton Street.

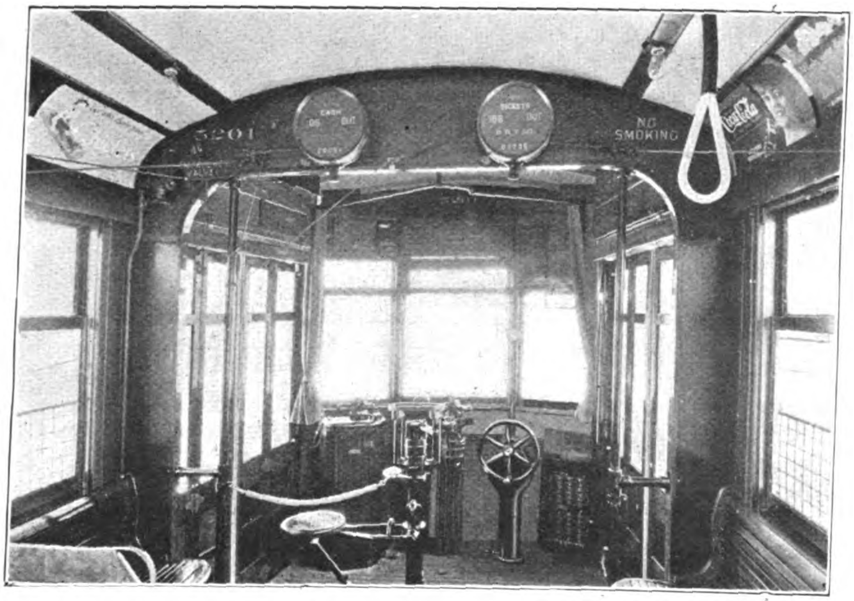
Industrial-Utilities Service Bureau is now located in Suite 509, M. E. Taylor Building, Louisville, Ky.

White Company, Cleveland, Ohio, has received word that the last shipment of thirty White Model 20 buses, completing an order of sixty, has reached Tokyo, Japan, to go into the service of the Tokyo Bus Company. The Tokyo Bus Company, with the addition of the sixty new jobs, now operates sixty-seven Model 20 White buses, which is one of the largest bus fleets in operation outside the United States. All of these jobs are equipped with eighteen-passenger bodies.

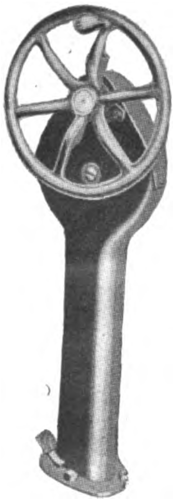
New Advertising Literature

International Engineering Corporation, Malden, Mass., has issued a pamphlet describing the working of the International "Automatic" Painting Machine.

Heine Boiler Company, St. Louis, Mo., has issued Bulletin 54, an illustrated pamphlet on the Lent-tube boiler V-type. The construction, design and need of this equipment are discussed in its pages.



The PEACOCK STAFFLESS BRAKE



It's there!

Maybe the emergency requiring its use will never arise. But experience shows that such emergencies do occur. Isn't it a comfort to know that the most powerful, most reliable hand-brake you can provide—*is there!*

Experienced motormen, full of confidence in its proved ability to stop the car, say of the Peacock Staffless Brake—*"it's there"!*

Lightest weight
Least platform space
Unfailing reliability
Graphite bronze bushings
Minimum maintenance

***See that Peacock Brakes are there* on your new cars**

NATIONAL BRAKE COMPANY, Inc.
890 Ellicott Square
Buffalo, N. Y.
Canadian Representative:
Lyman Tube & Supply Company, Limited
Montreal, Canada

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

The J. G. White Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants.
Steam and Electric Railroads, Buildings and
Industrial Plants, Transmission Systems.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation
Management
52 Vanderbilt Ave., NEW YORK

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation,
Studies on Financial and Physical Rehabilitation
Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

J. ROWLAND BIBBINS
Engineer—927 Fifteenth St., WASHINGTON
TRANSPORTATION SURVEYS
Organized Traffic Relief and Transit Development
Co-ordinating Motor Transport, Railroad and City
Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plan
Appraisals and Reports
CLEVELAND
1570 Hanna Bldg.
NEW YORK
84 Pine St.

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

KELLY, COOKE & COMPANY
Engineers
149 BROADWAY
NEW YORK
424 CHESTNUT STREET
PHILADELPHIA

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. Richmond, Va.
Established Feb. 1913.

C. B. BUCHANAN President W. H. PRICE, JR. Sec'y-Treas. JOHN F. LAYNG Vice-President
BUCHANAN & LAYNG CORPORATION
Engineering and Management, Construction, Financial Reports, Traffic Surveys and Equipment Maintenance
BALTIMORE 825 Equitable Bldg. Phone: Hanover 2142 NEW YORK 49 Wall Street

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

Transmission Line and Special Crossing Structures, Catenary Bridges
WRITE FOR OUR NEW DESCRIPTIVE CATALOG
ARCHBOLD-BRADY CO.
Engineers and Contractors SYRACUSE, N. Y.

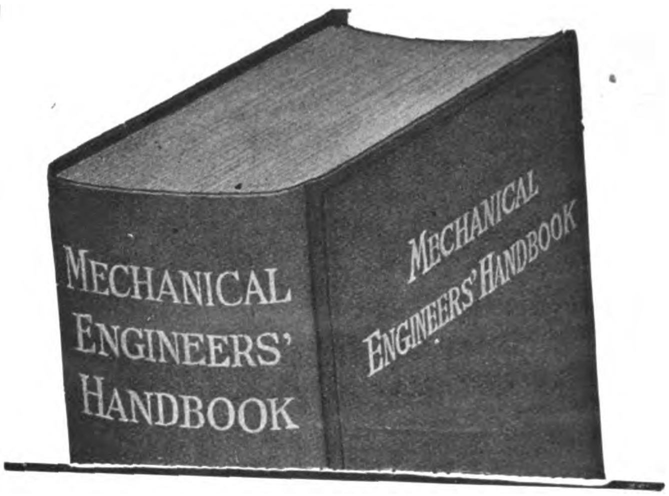
HUMAN ENGINEERING
Railway Audit and Inspection Company, Inc.
Fourth and Chestnut Sts., Philadelphia
Boston New Orleans New York Pittsburgh BRANCHES Baltimore Chicago Atlanta St. Louis

Dwight P. Robinson & Company
Incorporated
Design and Construction of
Electric Railways, Shops, Power Stations
125 East 46th Street, New York
Chicago Youngstown Atlanta Philadelphia Los Angeles Montreal Rio de Janeiro

The Most Successful Men in the Electric Railway Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

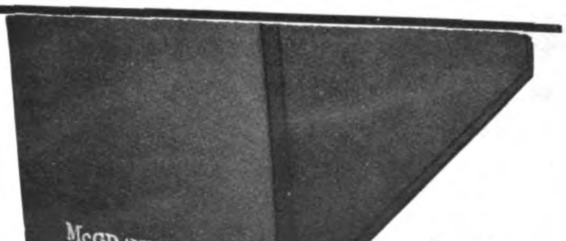
THE P. EDWARD WISH SERVICE
50 Church St. NEW YORK *Street Railway Inspection* DETECTIVES 131 State St BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.



MECHANICAL ENGINEERS' HANDBOOK
MECHANICAL ENGINEERS' HANDBOOK

Just Out!
New 1924 **MARKS** Second Edition



A bigger, better book, but the price remains $6.00

Examine the new 1924 MARKS for ten days free

MARKS' MECHANICAL ENGINEERS' HANDBOOK
Editor-in-Chief—LIONEL S. MARKS
Assisted by 59 Specialists.
Second Edition, Thoroughly Revised, 2000 pages, 4½x7, flexible, illustrated, $6.00 net, postpaid.

Wherever mechanical engineering data are required, MARKS' HANDBOOK has become the accepted authority because of its reliability, its comprehensiveness and its convenience.

Marks Made New For You
Now a thoroughly revised 1924 edition is available—practically a new book. All the data have been revised, some sections have been almost completely rewritten, much new material has been added.
The book stands today a complete presentation of essential mechanical engineering data and a complete synopsis of modern mechanical engineering theory.

The New 1924 Marks Brings
Reference service of 60 leading mechanical engineers.
Complete and authoritative information on every phase of mechanical engineering.
Specialized treatment, essential data, conveniently arranged.
Authoritative guidance, needed formulas, tables, fundamentals for reference, research and study.

Also a handy Travelers' Edition
As a further step in McGraw-Hill service, we are publishing in addition to the regular $6.00 edition of the new 1924 Marks, a handy Travelers' Edition, bound in three pocket-size volumes with flexible, waterproof Keratol covers and separate index, at $8.00 per set.

Free Examination Coupon
McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York.
You may send me on 10 days' approval the book checked.
......Marks' Mechanical Engineers' Handbook, Second Edition, $6.00 net, postpaid.
......Travelers' Edition of Marks' Handbook, in Three Volumes. Per set, $8.00 net, postpaid.
I agree to pay for the book or return it postpaid within 10 days of receipt.
Subscriber to Electric Railway Journal?..............
Signed ....
Address ....
Official Position ....
Name of Company ....
(Books sent on approval to retail purchasers in U. S. and Canada only.)
E. 4-12-24

Burying a

Doesn't Make

AND when such a track begins to deteriorate it is all the more costly to rip up the paving and make repairs.

Nothing short of a permanent track should go beneath a permanent pavement.

Years of service have demonstrated that the Dayton Resilient Track is the most permanent type of truly efficient track. It is permanent because it is a reinforced concrete track; truly efficient, because of its resiliency.

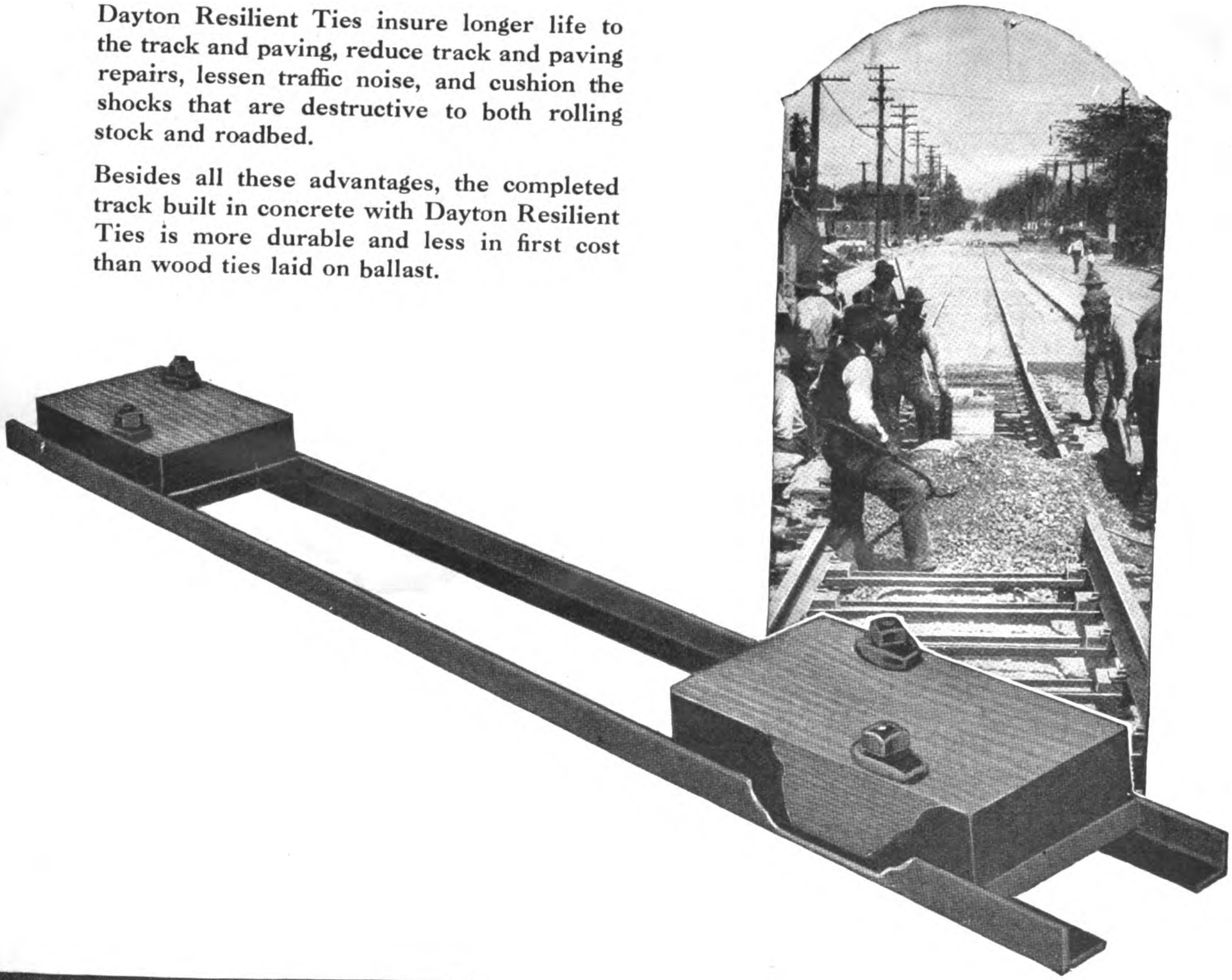
DAYTON

Temporary Track

It Permanent

Dayton Resilient Ties insure longer life to the track and paving, reduce track and paving repairs, lessen traffic noise, and cushion the shocks that are destructive to both rolling stock and roadbed.

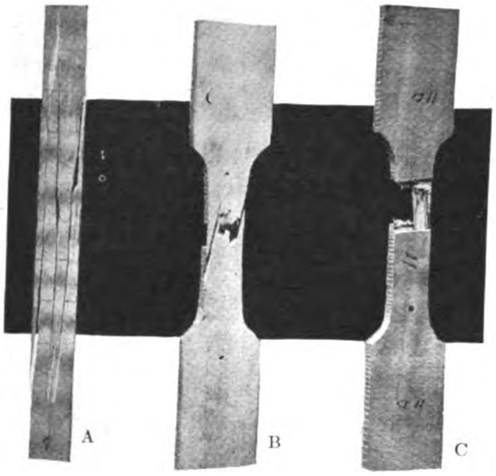
Besides all these advantages, the completed track built in concrete with Dayton Resilient Ties is more durable and less in first cost than wood ties laid on ballast.



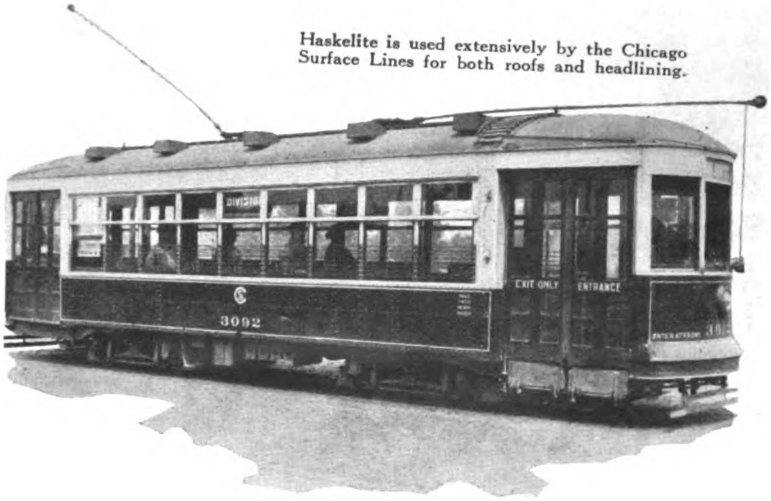
Resilient
TIE

THE DAYTON MECHANICAL TIE CO.
707 Commercial Bldg.
DAYTON, OHIO

The solid, substantial character of
COLLIER SERVICE
has placed it high among those permanent organizations recognized as National Institutions
Barron G. Collier
INCORPORATED



Characteristic fracture of solid wood (A) and Haskelite with the grain (B) and across the grain (C). These tests show how the stresses in both directions are more nearly equalized in Haskelite.

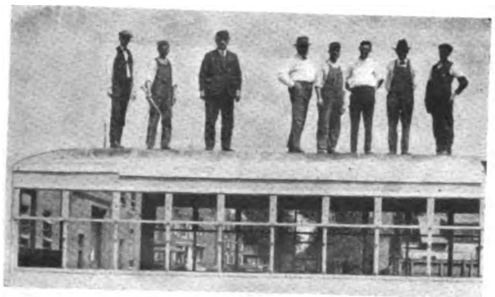


Haskelite is used extensively by the Chicago Surface Lines for both roofs and headlining.

Some tests which show

Why HASKELITE *Roofs*

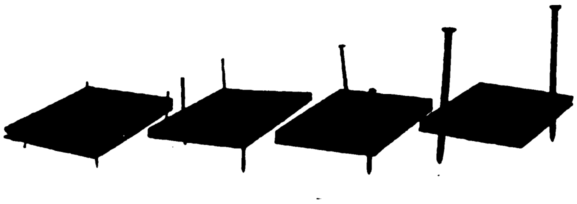
make better cars



The weight of eight men is easily supported by the HASKELITE roof panels. Yet this material weighs 30% less than tongue and groove poplar roofing.

Being at least 30% lighter than any other form of construction, roofs of HASKELITE are weight for weight, even stronger than steel. They can be built in few sections, greatly lessening the number of joints, which by reason of their stiffness, diminishes the strain at the joints, lessening chance of leaks. Strength being ample, the lessened weight lowers the center gravity of the car, improves its riding qualities, and lessens the upkeep expense.

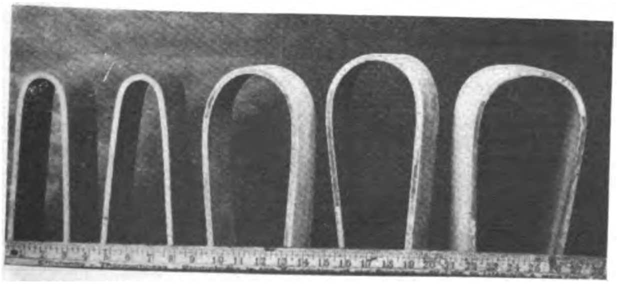
A four section HASKELITE roof can be applied, and completely trimmed in ***five hours*** by three men. At least double that time would be required to lay a t. and g. poplar roof.



Note the resistance to splitting when nails are driven close to the edge. HASKELITE is easy to work with and contributes to the stability of the construction.

HASKELITE combines strength, permanence and low cost. Hence its wide use in car and bus construction. Our engineering department will gladly answer any of your questions about HASKELITE, and will supply complete data on its use for this application upon request.

Ask also about PLYMETL for side panels on cars and buses.



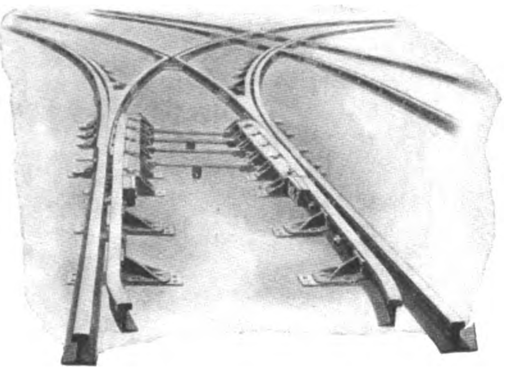
HASKELITE can be ***boiled in water*** and bent to small radius curves. Ordinary plywood separates under this treatment.

Haskelite Manufacturing Corporation
Chamber of Commerce Bldg.
Chicago, Ill.

TAYLOR-WHARTON IRON & STEEL CO.

TIOGA STEEL & IRON CO. | W^m WHARTON Jr. & CO. Inc. | PHILADELPHIA ROLL&MACH

Tisco Manganese Steel Housed Point Switch



Type "M.H.S."

Type "M.H.S." Manganese Steel Housed Point Switch used in subways and elevated roads in several large cities. The points of the switches are cast of Tisco Manganese Steel; the stock rails are offset to receive and protect the switch point. This type switch has been highly commended for meeting severe conditions. Elevated and subway systems require special work of unusual wear-resisting qualities, and Tisco Manganese Steel Products have the necessary characteristics to meet every demand.

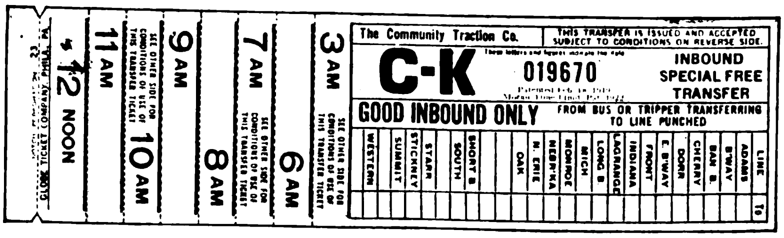
Railway properties seeking switches, frogs, crossings and other trackwork that will stand up under severest traffic will find it in the interest of low maintenance to adopt Tisco Manganese Steel Trackwork.

WM. WHARTON JR. & CO., INC.
Easton, Pa.

Taylor-Wharton Iron & Steel Co.	Wm. Wharton Jr. & Co.	Tioga Steel & Iron Co.	Phila. Roll & Machine Co.
Plant at High Bridge, N. J.	Plant at Easton, Pa.	Plant at Philadelphia, Pa.	Plant at Philadelphia, Pa.
Manganese Steel Wearing Parts	Special Trackwork Cylinders for Gases	Forgings Hammered and Pressed	Rolls and Rolling Mill Machinery

GTC

Study the Advantages of this Transfer



The Community Traction Co.
THIS TRANSFER IS ISSUED AND ACCEPTED SUBJECT TO CONDITIONS ON REVERSE SIDE.
C-K
019670
INBOUND SPECIAL FREE TRANSFER
GOOD INBOUND ONLY
FROM BUS OR TRIPPER TRANSFERRING TO LINE PUNCHED
WESTERN
SUMMIT
STICKNEY
STARR
SOUTH
SHORT B
OAK
N. ERIE
NEBR'KA
MONROE
MICH
LONG B
LAGRANGE
INDIANA
FRONT
E. B'WAY
DORR
CHERRY
BAN B.
B'WAY
ADAMS
LINE
To
3 AM
SEE OTHER SIDE FOR CONDITIONS OF USE OF THIS TRANSFER TICKET
6 AM
7 AM
SEE OTHER SIDE FOR CONDITIONS OF USE OF THIS TRANSFER TICKET
8 AM
9 AM
10 AM
SEE OTHER SIDE FOR CONDITIONS OF USE OF THIS TRANSFER TICKET
11 AM
12 NOON
GLOBE TICKET COMPANY, PHILA. PA.

The Time Limit Feature

1. No Punching.
2. Expired limit detected by length of ticket.
3. No possibility of confusing A.M. and P.M. as contrasting colors are used.

The Date Feature

1. No punching or notching.
2. Indicated by letters and figures, varied at pleasure.
3. No wasted transfers.

If you want to ask questions or wish samples, you're perfectly welcome

Globe Ticket Company 116 N. 12th St. Philadelphia, Pa.
Specialists in Tickets and Checks Since 1873 Los Angeles New York San Francisco

Your Passengers Will Enjoy Their Ride On
Hale-Kilburn Seats

Especially Designed for
One Man Safety Cars

Lightest Weight Stationary Steel Seat

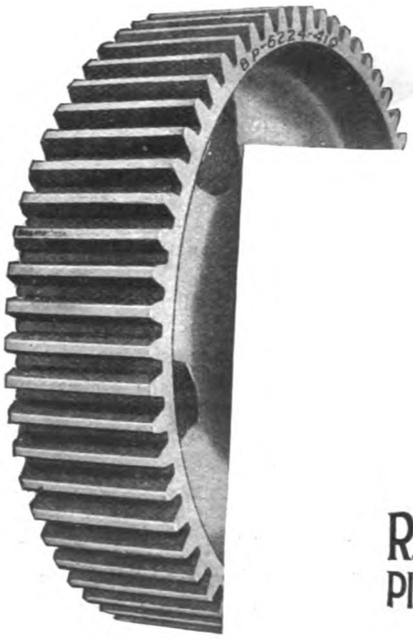
Lightest
Strongest
Simplest
Neatest

Lightest Weight Walkover Steel Seat

No higher in price than others
Write for particulars

Hale-Kilburn Company
PHILADELPHIA

New York	Chicago	Richmond	Atlanta	San Francisco	Los Angeles
30 Church St.	McCormick Bldg.	Mutual Bldg.	Candler Bldg.	71 First St.	447 E. 3rd St.



Nuttall

Can You Get This Guarantee With Any Other Gears, At Any Price?

We guarantee Nuttall BP Gears to last four times as long as untreated gears in the same service, and that means a cost saving of about 70%. If they are Helical Gears, they will last still longer and greatly reduce motor maintenance.

Do you want a trial set?

R.D. NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

MEMBER AERA

All Westinghouse Electric and Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

Everything in Insulation
WEDGES
BANDING WIRE
TWINE, TAPE, PAPER, VARNISH
and VARNISHED MATERIALS.

MITCHELL-RAND
"Everything in Insulation"

For shop use, we offer sample cards of Armature Wedges and Armature Twines; also booklets of Varnished Papers and Cloths, Insulating Papers, etc.

A handbook of 160 pages of helpful information will be sent free to any user of insulation.

MITCHELL-RAND MFG. CO.
18 VESEY ST., NEW YORK, N. Y.

This Paper is a "Member *of the* A.B.P."

To you, this is a fact of especial significance, for it means that this publication is part of a concerted movement to raise the level of publishing practice, to assure better service to both subscribers and advertisers.

The "A.B.P." is built upon and revolves around the following set of standards—

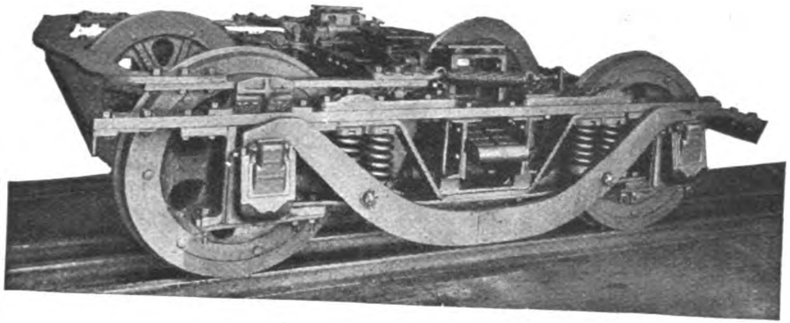
STANDARDS *of* PRACTICE

THE publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation statements, subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Publications which have subscribed to these standards have earned the preferred consideration accorded them.

THE ASSOCIATED BUSINESS PAPERS, INC.
220 West 42nd St., New York



Type "AA" Motor Truck

For Heavy High-Speed Electric Railway Service Baldwin Motor Trucks are Efficient and Economical

This type of Baldwin Improved Motor Truck is specially recommended on long interurban lines, where "limited" or sleeping cars are operated. It is also suitable for use under double-truck electric locomotives.

These trucks permit of easy inspection and repairs, and show low maintenance costs in operation.

Our nearest representative will furnish detailed information upon request.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U. S. A. **Cable Address, "Baldwin, Philadelphia"**

AURORA BEAC

Quality Cars for Aurora, Ill.

Here's a sample of what we can do when a superior kind of job is wanted. Just for example—note the panelled ends, and the Gothic windows with Florentine glass. These are some of the little things.

The St. Louis Car Company can give particular attention to getting the highest quality workmanship into every car order, no matter how large or small it may be.

St. Louis Car Company

St. Louis, Mo.

"The Birthplace of the Safety Car"

KERITE
Los Angeles and Salt Lake Railroad Riverside, Calif.
UNION PACIFIC SYSTEM
KERITE INSULATED WIRE & CABLE COMPANY
NEW YORK CHICAGO

AMELECTRIC PRODUCTS

AMERICAN ELECTRICAL WORKS. AMELECTRIC. Wires and Cables. PHILLIPSDALE, R.I.

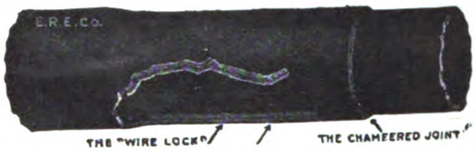
Reg. U. S. Pat. Office

Incandescent Lamp Cord

BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

ELRECO TUBULAR POLES



COMBINE

Lowest Cost — Lightest Weight
Least Maintenance — Greatest Adaptability

Catalog complete with engineering data sent on request

ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
New York City, 30 Church Street

PEIRCE INSULATED POLE BANDS

Give a very neat appearance to the pole.

Made of Open Hearth Steel and Double-Dip Hot Galvanized.

HUBBARD & COMPANY
PITTSBURGH—CHICAGO

Lapp Insulators

Lapp Insulator Co. Inc. Le Roy, N.Y.

Trade Mark

AUTOMATIC SIGNALS

Highway Crossing Bells
Headway Recorders

NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KENTUCKY.

ANACONDA TROLLEY WIRE

ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

Shaw Lightning Arresters

Standard in the Electric Industries
for 35 years

Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

Standard Underground Cable Co.
Manufacturers of
Electric Wires and Cables of all kinds;
also Cable Terminals, Junction Boxes, etc.
Boston Philadelphia Pittsburgh Detroit New York
San Francisco Chicago Washington St. Louis

ROEBLING

WELDING CABLE
ELECTRICAL WIRES and CABLES
John A. Roebling's Sons Company, Trenton, N. J.

Chapman
Automatic Signals

Charles N. Wood Co., Boston

Lorain Special Trackwork Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE
CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

Bethlehem Products for Electric Railways

Rolled Steel Alloy Crossing, Design 960.

Frogs, Switches, Special Trackwork, Rails, Car Wheels, Gear Blanks, Axles, Armature Shafts, Splice Bars, Bolts, Spikes, and Track Accessories.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
Sales Offices in the Following Cities:
New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Cincinnati Detroit Chicago St. Louis San Francisco

SPECIALISTS
in the
Design and Manufacture
of
Standard—Insulated—and Compromise Rail Joints

The Rail Joint Company
61 Broadway, New York City

American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new
Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

BARBOUR-STOCKWELL CO.
205 Broadway, Cambridgeport, Mass.
Established 1858

Manufacturers of
Special Work for Street Railways
Frogs, Crossings, Switches and Mates
Turnouts and Cross Connections
Kerwin Portable Crossovers
Balkwill Articulated Cast Manganese Crossings

ESTIMATES PROMPTLY FURNISHED

BUDA
ESTABLISHED
1881

Special Track Equipment and Layouts of all kinds

THE BUDA COMPANY
Harvey (Suburb Chicago) Illinois

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

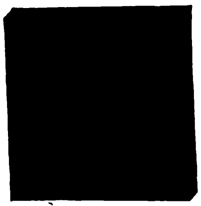
Builders since 1868 of Water Tube Boilers of continuing reliability

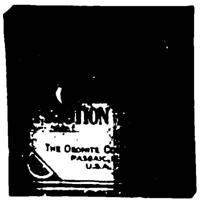
BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building





DUNDEE "A" AND "B" FRICTION TAPES
are Okonite Products
'Nuff Said!

Write for Samples and Circulars
THE OKONITE CO., Passaic, N. J.
Incorporated 1884
Sales Offices: *New York—Atlanta—Pittsburgh—San Francisco*
Agents: Central Electric Co., Chicago, Ill.; Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.
OKONITE TRADE MARK

AETNA INSULATION LINE MATERIAL
Third Rail Insulators, Trolley Bases, Harps and Wheels, Bronze and Malleable Iron Frogs, Crossings, Section Insulators, Section Switches
Albert & J. M. Anderson Mfg. Co.
289-93 A Street Boston, Mass.
Established 1877
Branches—New York, 135 B'way
Philadelphia, 429 Real Estate Trust Bldg. Chicago, 105 So. Dearborn St.
London, 12 Moor Lane, E. C. 2

METAL SAFETY CROSS TIES
Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.
REVOLUTIONIZES ROADBEDS
Write for descriptive folder and quotation.
METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

GODWIN STEEL PAVING GUARDS
Adapted to all types of rails and paving.
W. S. GODWIN CO., Inc.
Proven by service to economically prevent seepage and disintegration of street railway paving.
Write for Illustrated Catalog No. 20.
Race & McComas Sts., Baltimore, Md.

RAMAPO AJAX CORPORATION
Ramapo Automatic Return Switch Stands for Passing Sidings
RACOR TRADE MARK
RACOR Tee-Rail Special Work
Manganese Construction
GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

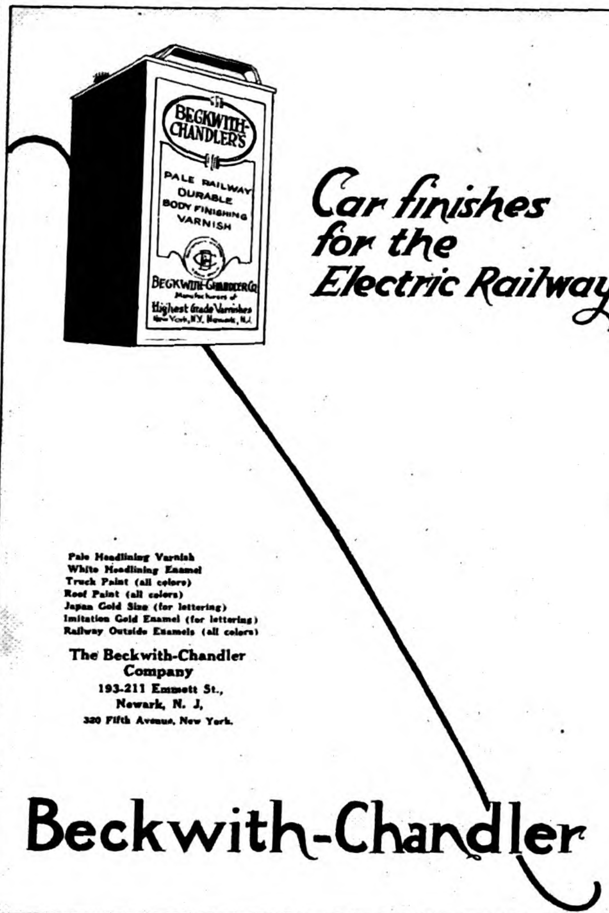
ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.
Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

NEW and RELAYING RAILS
1 TON OR 1000
TRACK EQUIPMENT
L. B. FOSTER CO.
PITTSBURGH - PENNSYLVANIA
RAIL ACCESSORIES
NEW YORK · JERSEY CITY · PHILADELPHIA · HAMILTON O.

BRAZED Rail Bonds ARC WELD
ERICO
Portable Arc Welding Outfits
The Electric Railway Improvement Co.
Cleveland, Ohio

A Single Segment or a Complete Commutator
is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.
Cameron Electrical Mfg. Co., Ansonia, Connecticut

ECONOMIZERS
reduce fuel costs by making use of waste exhaust gases to preheat the boiler feed. Patented construction proven by 20 years of service.
FOSTER
SUPERHEATERS
improve engine, turbine and boiler economy by enabling a given amount of steam to do more work. Over 10,000 installations in stationary power plants.
POWER SPECIALTY CO., Boston, Philadelphia, Pittsburgh, Detroit Kansas City, Chicago, San Francisco, Dallas, London, Eng. 111 Broadway, NEW YORK


BECKWITH-CHANDLER'S
PALE RAILWAY DURABLE BODY FINISHING VARNISH
BECKWITH-CHANDLER CO.
Manufacturers of Highest Grade Varnishes
New York, N.Y. Newark, N.J.

Car finishes for the Electric Railway

Pale Headlining Varnish
White Headlining Enamel
Truck Paint (all colors)
Roof Paint (all colors)
Japan Gold Size (for lettering)
Imitation Gold Enamel (for lettering)
Railway Outside Enamels (all colors)

The Beckwith-Chandler
Company
193-211 Emmett St.,
Newark, N. J,
320 Fifth Avenue, New York.

Beckwith-Chandler

SCREECH!!**!
HOWL!!**
GRIND!!

All eliminated
by
MEXICAN
GRAPHITE CURVE GREASE

Unaffected by rain, heat or cold.
Cars won't scrape it off.
Adheres to the guard of the rail.

Write today for particulars.

THE UNITED STATES GRAPHITE CO.
SAGINAW, MICHIGAN

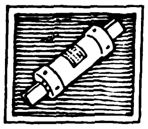
THE WORLD'S STANDARD
"IRVINGTON"

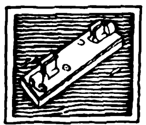
Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper

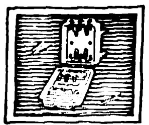
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

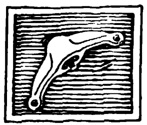
Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities

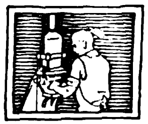
J-P Products of interest to Electric Railways

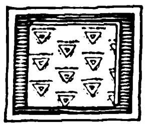

NOARK *Fuses*


NOARK *Fuse Clips*
CUTOUT BASES


NOARK *Service and Underground Boxes*


Railway and Mine hangers and insulators


J-P Molding Service [Contract Basis]


VULCABESTON
Sheet and Rope Packing

JOHNS-PRATT CO. HARTFORD, CONN.

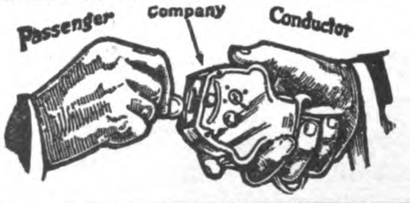
Heywood-Wakefield
CAR SEATS
of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.
HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York, Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition

BUCKEYE JACKS
high-grade R. R. Track and Car Jacks
The Buckeye Jack Mfg. Co.
Alliance, Ohio

PS HEATERS

Car Heating and Ventilation
are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.
The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.



Direct
Automatic
Registration
By the
Passengers
Rooke Automatic
Register Co.
Providence, R. I.

OHMER
FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

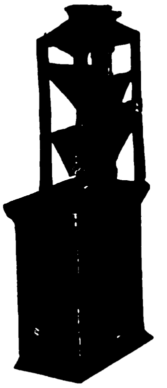
OHMER FARE REGISTER CO.
Dayton, Ohio

Capital Te
Electrical engineer w
sires to enter busi
contractor, dealer
B. O.-865, Elec. Wo
Chicago.

Don't Overlook Opportunities

Men who regularly keep in touch with the market through other channels often overlook the many opportunities that are to be found in the

SEARCHLIGHT SECTION
For Every Business Want
"*Think* SEARCHLIGHT *First*"
0156

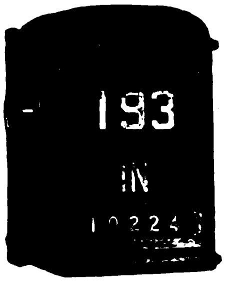


You are *assured* of the safe delivery to your counting room of every fare collected on your cars, *providing* you use

CLEVELAND FARE BOXES

and give them the *proper* supervision.

The Cleveland Fare Box Co.
Cleveland, Ohio
Canadian Cleveland Fare Box Co., Ltd.,
Preston, Ont.


193
IN
10224

Type R-10

International Registers

Made in various types and sizes to meet the requirements of service on street and city system. Complete line of registers, counters and car fittings.

Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

JOHNSON Universal Changer

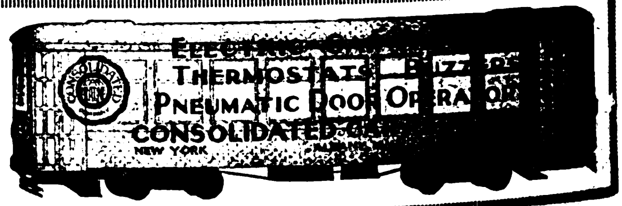
Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

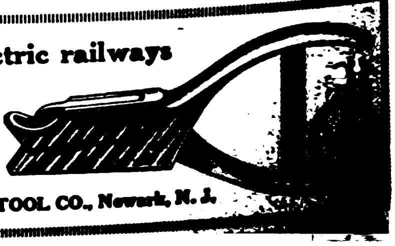
Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.


ELECTRIC
THERMOSTATS
BUZZERS
PNEUMATIC DOOR OPERATOR
CONSOLIDATED
NEW YORK

75% of the electric railways
use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.



You're having brush trouble

CORRECT IT
USE LE CARBONE CARBON BRUSHES

They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd.,
Montreal and Toronto

With a low price and
Extravagant promises, anyone
can sell once.
"Tool Steel" gears sell
regularly.

Tool Steel Quality

The Tool Steel
Gear and Pinion Co.
CINCINNATI, O.

B. A. HEGEMAN, Jr., President C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.
Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

Waterproofed Trolley Cord

SILVER LAKE A

Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.

FOR POSITIVE SATISFACTION ORDER
SILVER LAKE

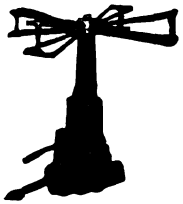
If you are not familiar with the quality you will be surprised at its ENDURANCE and ECONOMY.

Sold by Net Weights and Full Lengths

SILVER LAKE COMPANY
Manufacturers of bell, signal and other cords.
Newtonville, Massachusetts

PROVIDENCE **H-B**
FENDERS LIFE GUARDS

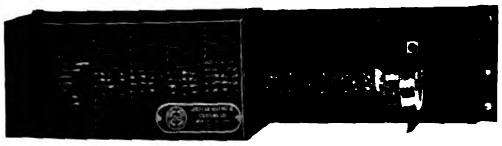
The Consolidated Car Fender Co., Providence, R. I.
Wendell & MacDuffie Co., 110 E. 42nd St., New York
General Sales Agents



Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars

Perey Manufacturing Co., Inc.
30 Church Street, New York City

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No.
478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

RAILWAY UTILITY COMPANY
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings:
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

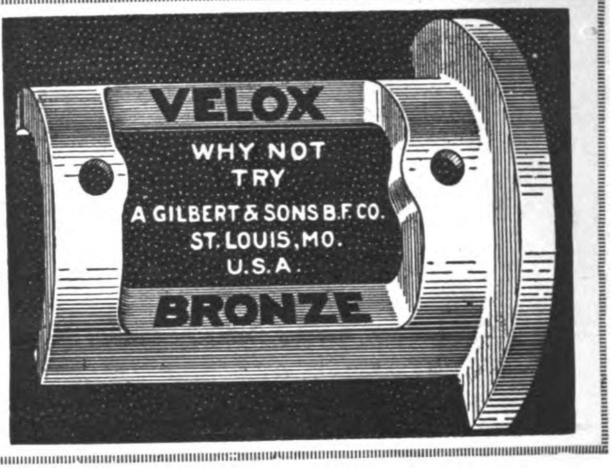
Write for Catalogue

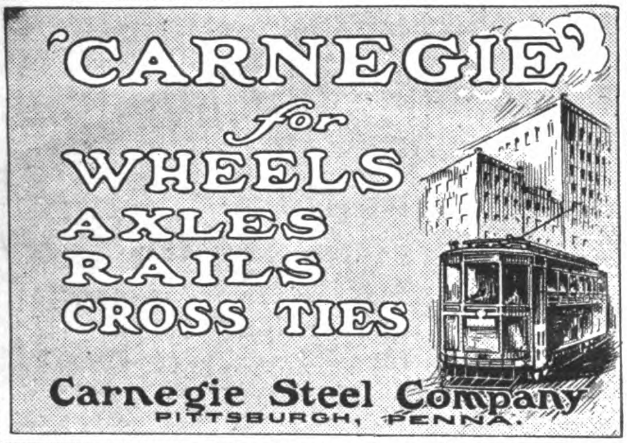
1328 Broadway
New York, N. Y.

The Kalamazoo Trolley Wheels

have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.

THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.


VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE



ASTOUNDING
Service Records are Being Made!

Traction companies are getting from 50,000 to 100,000 miles from the Thornton Trolley Device. The long life of the bearings, the perfectly balanced wheel and the method of lubrication explain this unparalleled service.

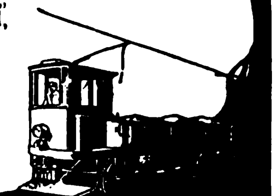
Letters from users ring with praise of the Thornton. Reduce your repair bills and road delays by using this device. Ask for Bulletin.

Thornton Trolley Wheel Co.
Incorporated
Ashland, Kentucky

The Differential Car

An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.

The Differential Steel Car Co.
Findlay, Ohio



AJAX PERFECTO

SHOCKS
have little effect on
AJAX CHECK PLATES
because these plates are made from Ajax Perfecto Bronze

The strongest and toughest metal on the market. They will bend before they will break and give longest possible service.

The Ajax Metal Company
Established 1880
Philadelphia, Pa.
NEW YORK CHICAGO BOSTON CLEVELAND

N-L VENTILATORS
for Electric Railways and Motor Buses.
Unexcelled for ventilation and appearance.
Write for new catalogue
THE NICHOLS-LINTERN COMPANY
7960 Lorain Ave., Cleveland, Ohio
N-L Products manufactured and sold in Canada by
Railway and Power Engineering Corporation, Ltd.
133 Eastern Avenue, Toronto, Ontario

"Boyerized" Products Reduce Maintenance

Bemis Trucks
Case Hardened Brake Pins
Case Hardened Bushings
Case Hardened Nuts and Bolts
Manganese Brake Heads
Manganese Transom Plates
Manganese Body Bushings
Bronze Axle Bearings

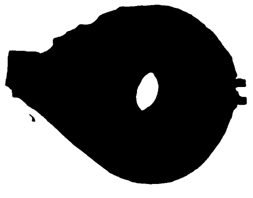
Bemis Pins are absolutely smooth and true in diameter. We carry 40 different sizes of case hardened pins in stock. Samples furnished. Write for full data.

Bemis Car Truck Co., Springfield, Mass.

"OSKELITE"

The Stop Light for street cars. Operates from brake system. Details on request.

The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.



CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. Write Us.
Chillingworth Mfg. Co.
Jersey City, N. J.

SEARCHLIGHT SECTION

POSITIONS VACANT

GENERAL shop foreman wanted for Middle West property, experienced in heavy traction equipment as well as city. In application, state qualifications, references and salary expected. P-678, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

AS M. M. or with chance for advancement. Experienced low and high voltage D.C. equipment, passenger and freight, city and interurban. Expert on motor and controller repairs. PW-672, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

AS master mechanic, 20 years' experience in all departments, also type M and H. L. Control; can handle labor. A1 reference from past and present employers. PW-684, Elec. Railway Journal, Old Colony Bldg., Chicago, Ill.

AUDITOR, with thorough experience large railway, electric and gas properties, seeks engagement. PW-677, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

CIVIL engineering draftsman seeks opening in drawing office or field with street railway company or manufacturer. PW-679, Electric Railway Journal, Real Estate Trust Bldg., Philadelphia, Pa.

ENGINEER wants position, several years' experience on electric traction and power construction, trolley and third rail installation, steam and water power. Field work preferred; University degrees and shop training, mechanical-electrical, also practical surveyor, superintendent, concrete work, etc. Work described in former years of the Journal. PW-683, Elec. Railway Journal, 10th Ave. at 36th St., New York.

GRADUATE engineer desires permanent position in larger field. Fifteen years' successful experience. Five in charge maintenance city and suburban system. Rehabilitation, design, special work, welding. PW-682, Electric Railway Journal, Real Estate Trust Bldg., Phila., Pa.

MASTER mechanic. Mr. Executive, can you use an opportunity-seeker, not a job-hunter? Now employed by a large Street-Car Company but seek an advanced position. 20 years of experience on city and interurban lines, trackless trolleys and gas buses. Thoroughly familiar with all types of equipment; modern shop practice and ability to handle labor successfully; can keep equipment up to high standard at economical cost. Absolutely the highest references. Correspond with me at once if you seek a real high-type man. PW-680, Electric Railway Journal, 10th Ave. at 36th St., New York.

MASTER mechanic or engineer of equipment, technical education and five years' experience in manufacturing and maintenance of equipment. PW-681, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP,
MANAGEMENT, CIRCULATION,
ETC., REQUIRED BY THE
ACT OF CONGRESS OF
AUGUST 24, 1912

Of Electric Railway Journal, published weekly at New York, N. Y., for Apr. 1, 1924.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of McGraw-Hill Company, Inc., Publishers of Electric Railway Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McMcGraw-Hill Company, Inc., 10th Ave. at 36th St., New York, N. Y. Editors, H. W. Blake and H. L. Brown, 10th Ave. at 36th St., New York. Managing Editor, None. Business Manager, David Cameron, 10th Ave. at 36th St., New York.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.) McGraw-Hill Company, Inc., 10th Ave. at 36th St., New York, N. Y. James H. McGraw, 10th Ave. at 36th St., New York, N. Y. Arthur J. Baldwin, 10th Ave. at 36th St., New York, N. Y. Henry W. Blake, 10th Ave. at 36th St., New York, N. Y. Fred R. Low, 10th Ave. at 36th St., New York, N. Y. Leonard D. Baldwin, 27 Pine Street, New York, N. Y. James H. McGraw and James H. McGraw, Jr., 10th Ave. at 36th St., New York, N. Y., Trustees for Harold W. McGraw, James H. McGraw, Jr., Curtis W. McGraw, Donald C. McGraw. Essex County Trust Co., et al, East Orange, New Jersey, Trustee for Estate of John A. Hill. Leonard D. Baldwin and Arthur J. Baldwin, 27 Pine Street, New York, N. Y., Trustees for Donald Baldwin, Grace Riker, Franklin Baldwin, Cynthia Hazelton. James H. McGraw and James H. McGraw, Jr., 10th Ave. at 36th St., New York, N. Y., Trustees for Marian McGraw. Mason Britton, 10th Ave. at 36th St., New York, N. Y. Malcolm Muir, 10th Ave. at 36th St., New York, N. Y., Trustee for Lida K. Muir. Grace W. Mehren, 53 Fairview Ave., So. Orange, N. J. Curtis W. McGraw, 370 Seventh Ave., New York, N. Y. Donald C. McGraw, 10th Ave. at 36th St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

McGRAW-HILL COMPANY, INC.
C. H. THOMPSON, Secretary.

Sworn to and subscribed before me this 26th day of March, 1924.

[Seal.] MARTIN J. WIEMER.

Notary Public Kings County Certificate No. 27. Certificate filed in New York County No. 44.

(My Commission expires March 30, 1924.)

WANTED
Second-hand
MERRY-GO-ROUND
When replying state age, lowest price and submit photo.
The Kingston, Portsmouth & Cataraqui Electric Railway Company
Kingston, Ont.

MOTORS For SALE
50 Westinghouse No. 101-B
40 Westinghouse No. 307
60 General Electric No. 80
Immediate Shipment Low Price
Electric Equipment Co.
Cars—Motors
601 Commonwealth Bldg., Phila., Pa.

Relaying Rails
NEW RAILS - ACCESSORIES
Buy Guaranteed Relaying Rails and Save 30% to 50%
1 Ton or 1000
L B FOSTER CO
PITTSBURGH, PA. NEW YORK CITY
JERSEY CITY - PHILADELPHIA - HAMILTON, O.

FOR SALE
Deck Plate Girder Bridge
built for electric railway by American Bridge Co. 61 ft. long, 20 tons weight.
For particulars address
York Utilities Company
Kennebunk, Maine.

FOR SALE
100 Nuttall No. 14 Trolley Bases
TRANSIT EQUIPMENT COMPANY
501 Fifth Avenue, New York.

WANTED
Truck Cars and Bodies
2—Standard Single Truck Cars, complete, and 2 bodies only.
PARIS TRANSIT CO., Paris, Texas.

FOR SALE
Electric Locomotive
Standard G. E. 50-ton Locomotive in first-class condition. Locomotive may be seen in daily operation.
ALBANY SOUTHERN R. R. CO.,
Rensselaer, N. Y.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
St. Louis Car Co.
Westinghouse E. & M. Co.

Babbitt Metal
Ajax Metal Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co., The

Batteries, Dry
National Carbon Co.

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
Brill Co., J. G., The
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Consolidated Car Heati'g Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Boilers
Babcock & Wilcox Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Book Publishers
McGraw-Hill Book Co., Inc.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Brill Co., The J. G.
National Ry. Appliance Co
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co.
National Brake Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
National Carbon Co.
U. S. Graphite Co.
Westinghouse E. & M. Co.

Brushes, Graphite
National Carbon Co.
U. S. Graphite Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Cables. (See Wires and Cables.)

Cambric Tapes, Yellow and Black Varnish
Irvington Varnish & Ins. Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
Brill Co., J. G., The
Differential Steel Car Co.
St. Louis Car Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heati'g Co.
Westinghouse E. & M. Co.

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Gas, Rail
Brill Co., J. G., The
St. Louis Car Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

Cars, Self-Propelled
Brill Co., J. G., The
General Electric Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
Bemis Car Truck Co.
St. Louis Car Co.

Castings, Malleable and Brass
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
St. Louis Car Co.

Catchers and Retrievers, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceiling Car
The Pantasote Co., Inc.

Ceilings, Plywood, Panels
Haskelite Mfg. Corp.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Elec. Service Supplies Co.

Coils Armature and Field
Economy Elec. Devices Co.
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
Intern'l Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
General Electric Co.
Westinghouse E & M. Co.

Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.

Compressors, Air Portable
Ingersoll-Rand Co.

Condensor Papers
Irvington Varnish & Ins. Co.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Consolidated Car Heat. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St Louis Car Co.
Westinghouse Tr. Br. Co.

Cranes
American Engineering Wks.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossing, Frog & Switch
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Crossing, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.

Crossings
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
The Pantasote Co., Inc.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co
Transit Equipment Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G
Consolidated Car H't'g Co.
General Electric Co.
Hale-Kilburn Co.
Nat'l Pneumatic Co., Inc.
St. Louis Car Co.

Doors & Door Fixtures
Brill Co., The J. G.
Consolidated Car Heati'g Co.
General Electric Co.
Hale-Kilburn Co.
Morton Mfg. Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.

Ears
Ohio Brass Co.

Electrical Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Roebling's Sons & Co., J. A.

Electric Grinders
Railway Track-work Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbins, J. Rowland
Buchanan & Lay Corp.
Day & Zimmerman, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelly-Cooke & Co.
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Railway Audit & Inspection Co.
Richey, Albert S.
Robinson & Co., Dwight P.
Sanderson & Porter
Stevens & Wood
Stone & Webster
White Eng. Corp., The J. G.
Wortham, Edwin

Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Fare Boxes
Cleveland Fare Box Co.
Economy Elec. Devices Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.

Fare Registers
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Flangeway Guards, Steel
Godwin Co., Inc., W. S.

Floodlights
Elec. Service Supplies Co.

Forgings
Brill Co., J. G., The

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Funnell Castings
Wharton, Jr. & Co., Wm.

Fuses and Fuse Boxes
Consolidated Car Heati'g Co.
General Electric Co.
Westinghouse E. & M. Co

Fuses, Cartridge, Non-Refillable & High Voltage
Johns-Pratt Co.

Fuses, Refillable
General Electric Co.
Johns-Manville, Inc.
Johns-Pratt Co.
Power Specialty Co.

Gaskets
Westinghouse Tr. Br. Co.

Gasoline Torches
Economy Elec. Devices Co.

Gas Producers
Westinghouse E. & M. Co.

Gas-Electric Cars
General Elec. Co.
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.
Brill Co., J. G., The

Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gong (See Bells and Gongs)

Greases (See Lubricants)

Grinders and Grind. Supplies
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Bricks and Wheels
Railway Track-work Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson Mfg. Co., A.&J.M
Elec. Service Supplies Co.
More-Jones Brass Metal Co.
Nuttall Co., R. D.
Star Brass Works
Thornton Trolley Wheel Co.

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Headlining
Haskelite Mfg. Corp.
The Pantasote Co., Inc.

Heaters, Car (Electric)
Consolidated Car Heati'g Co.
Gold Car Heat. & Ltg. Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Elec. Service Supplies Co.
Smith Heater Co., Peter

Helmets—Welding
Railway Track-work Co.

Hoists, Portable
Ingersoll-Rand Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating Signals
Oskel Equipment Co.

Instruments Measuring, Testing and Recording
Economy Elec. Devices Co.
Elec. Service Supplies Co.
General Electric Co.
Johns-Pratt Co.
Westinghouse E. & M. Co

Insulating Cloth, Paper and Tape
General Electric Co.
Irvington Varnish & Ins. Co
Mitchell-Rand Mfg. Co.
Okonite Co.
Stand. Underground Cable Co.
Westinghouse E. & M Co.

Insulating, Silk & Varnish
Irvington Varnish & Ins. Co

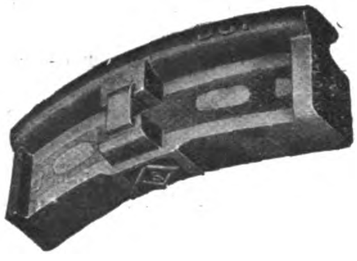
Insulation (See also Paints)
Anderson Mfg. Co., A. & J. M.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins Co
Mitchell-Rand Mfg. Co.
Okonite Co.
Westinghouse E. & M. Co.

Insulation Slots
Irvington Varnish & Ins. Co.

Insulators (See also Line Materials)
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.

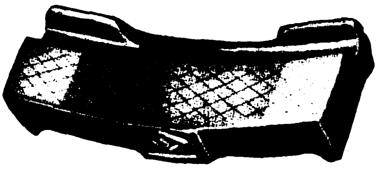
Brake Shoes
A.E.R.A. Standards

Diamond "S" Steel Back is the Best Type



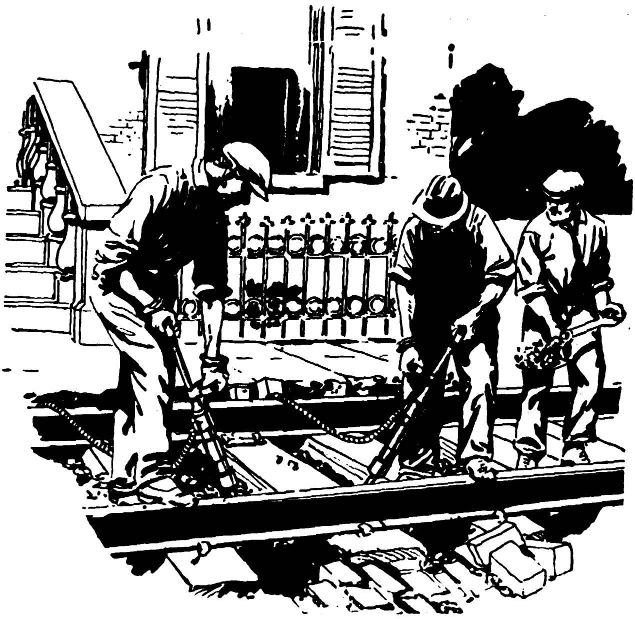
Standard Patterns for

SAFETY CAR



D-67 for Narrow Treads
D-87 for Wide Treads

American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.



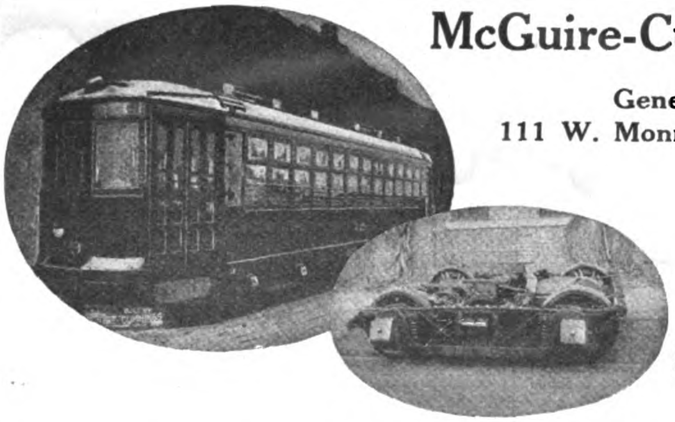
Ingersoll-Rand Pneumatic Tie Tampers

Reduce track tamping
and maintenance costs.

Ask for Bulletin 9123

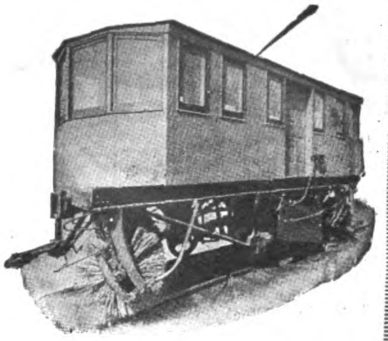
INGERSOLL-RAND COMPANY
11 Broadway, New York 170-TT

McGuire-Cummings Manufacturing Co.



General Offices:
111 W. Monroe St., Chicago, Ill.

Street Cars
Trucks
Snow Sweepers



TULC A LUBRICANT

We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC
on your equipment

The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

MORE-JONES "TIGER-BRONZE" AXLE AND ARMATURE BEARINGS

Not always the cheapest, but ever lowest in ultimate cost

MORE-JONES BRASS & METAL CO.
St. Louis, Missouri.

General Electric Co.
Irvington Varnish & Ins. Co
Ohio Brass Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Cranes, Hoists and Lifts)
Buckeye Jack Co.
Buda Co.
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
Anderson Mfg. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.
Ohio Brass Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Protection
Anderson Mfg. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson Mfg. Co., A.&J.M.
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Wharton, Jr. & Co., Wm.

Locomotives, Electric
Baldwin Locomotive Works
General Electric Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricating Engineers
Galena Signal Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co.
Universal Lubricating Co.

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Castings
Wharton, Jr. & Co., Wm.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.
Wharton, Jr. & Co., Wm.

Manganese Steel Switches Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters (See Instruments)

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses (See Buses, Motor)

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
Allis-Chalmers Mfg. Co.
General Electric Co.

Motormen's Seats
Brill Co., J. G.
Elec. Service Sup. Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Barbour-Stockwell Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Hubbard & Co.

Oils (See Lubricants),

Omnibuses (See Buses, Motor)

Oxy-Acetylene (See Cutting Apparatus, Oxy-Acetylene)

Packing
Elec. Service Supplies Co.
Power Specialty Co.
Westinghouse E. & M. Co.

Paints and Varnishes (Insulating)
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.

Paints, Varnishes, Preservatives
Beckwith-Chandler Co.

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co

Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdy. Co

Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Power Specialty Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Elec. Ry. Equipment Co.
Hubbard & Co.

Pole Reinforcing
Hubbard & Co.

Poles & Ties Treated
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.

Poles, Ties, Posts, Piling & Lumber
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.

Poles, Trolley
Bell Lumber Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

Porcelain Special High Voltage
Lapp Insulator Co., Inc.

Portable Grinders
Buda Co.

Potheads
Okonite Co.

Power Saving Devices
Economy Elec. Devices Co.
National Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Rail Joint Co., The

Rail Joints—Welded
Lorain Steel Co.

Rails, Relaying
Foster Co., L. B.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Foster Co., L. B.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Rail Welding
Railway Track-work Co.

Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Ohmer Fare Register Co.
Rooke Automatic Rg. Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Elec. Service Sup. Co.

Resistances
Consolidated Car Heat. Co.

Resistance, Wire and Tube
General Electric Co.
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Roofing, Car
The Pantasote Co., Inc.

Roofs
Haskelite Mfg. Corp.

Sanders, Track
Brill Co., The J. G.
Elec. Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
St. Louis Car Co.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.

Seats, Bus
Brill Co., J. G., The
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co, The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
The Pantasote Co., Inc.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co.
Transit Equipment Co.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings, Center and Side)

Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
Wood Co., Chas. N.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A.&J.M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
More-Jones Metal & Brass Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Irvington Varnish & Ins. Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Steel and Steel Products
Carnegie Steel Co.

Steel Castings
Wharton, Jr. & Co., Wm.

Steps, Car
Brill Co., J. G., The
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Subway Boxes
Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.
Power Specialty Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switches, Safety
Johns-Pratt Co.

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Switches and Switchboards
Anderson Mfg. Co., A. & J.M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Tamper Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.

Terminals, Cable
Std. Underground Cable Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heat. Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

Tickets and Transfers
Globe Ticket Co.

Ties, All-Metal
Metal Safety R. R. Tie Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

Ties and Tie Rods, Steel
Barbour-Stockwell Co.
Carnegie Steel Co.
International Steel Tie Co.

Tool Steel
Bethlehem Steel Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Tongue Switches
Wharton, Jr. & Co., Wm.

Torches, Acetylene (See Cutting Apparatus)

Towers and Transmission Structures
Archbold-Brady Co.
Westinghouse E. & M. Co.

Track Expansion Joints
Wharton, Jr. & Co., Wm.

Track Grinders
Railway Track-work Co.

Trackless Trolley Cars
Brill Co., J. G., The
St. Louis Car Co.

Track, Special Work
Barbour-Stockwell Co.
Bethlehem Steel Co.
Buda Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Transfer (See Tickets)

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Material, Overhead
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolley Wheel Bushings
More-Jones Brass & Metal Co.

Trolley Wheels & Harps
More-Jones Brass & Metal Co.
Thornton Trolley Wheel Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Bridgeport Brass Co.
Roebling's Sons Co., J. A.

Trucks, Car
Baldwin Locomotive Works
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Tubing, Yellow & Black Flexible Varnish
Irvington Varnish & Ins. Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Turbines, Water
Allis-Chalmers Mfg. Co.

Turnstiles
Elec. Service Supplies Co.
Percy Mfg. Co., Inc.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers & Silks
Irvington Varnish & Ins. Co.

Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Welded Rail Joints
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welders, Portable Electric
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
General Electric Co.
International Oxygen Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Welding Steel
Elec. Ry. Improvement Co.
Railway Track-work Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.
Carnegie Steel Co.

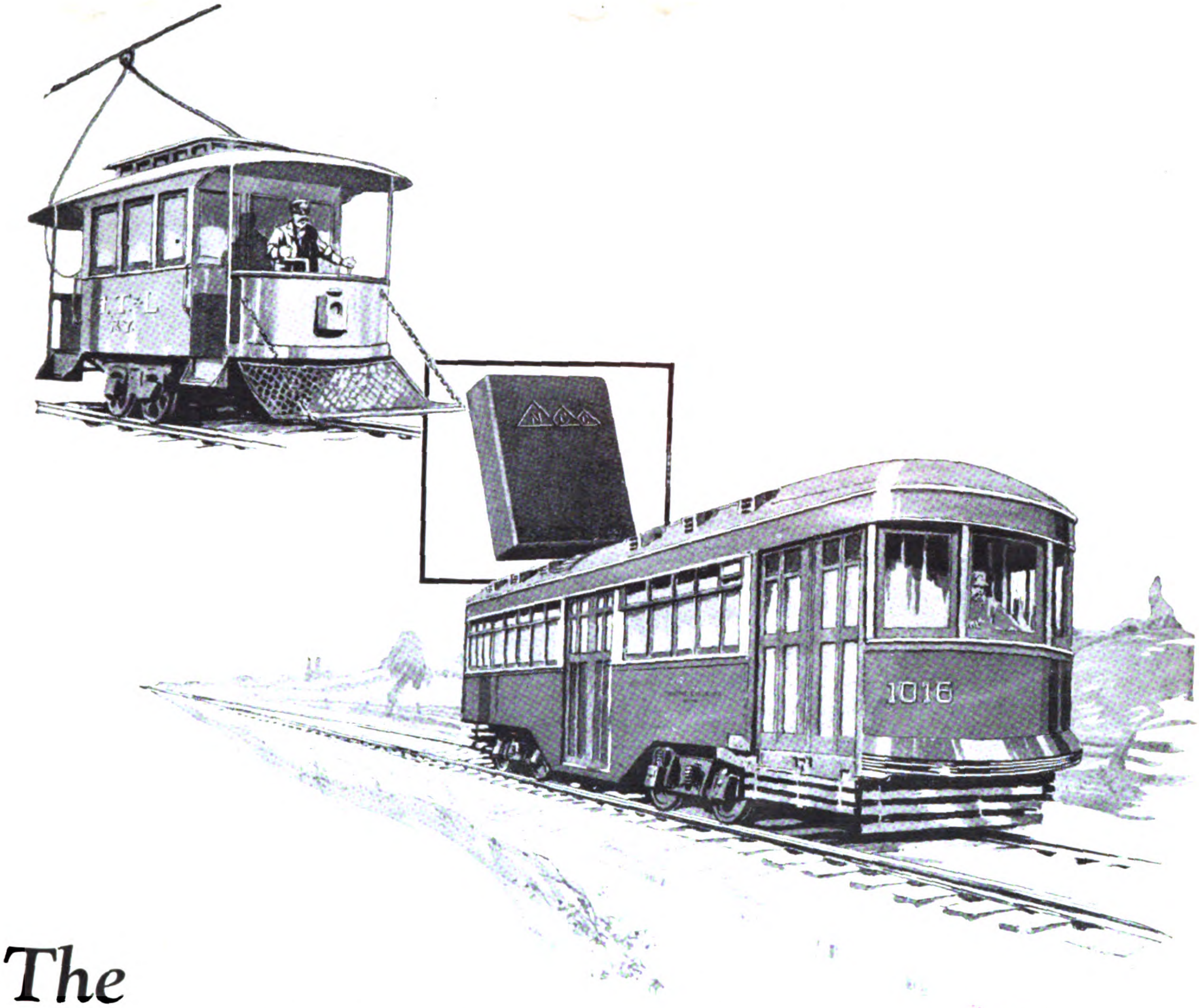
Wheels, Wrought Steel
Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Wire Rope
Roebling's Sons Co., J. A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Bridgeport Brass Co.
General Electric Co
Kerite Ins. Wire & Cable Co.
Okonite Co.
Roebling's Sons Co., J. A.
Std. Underground Cable Co.
Westinghouse E. & M. Co.



The

TRADITION *in* TRACTION

NATIONAL PYRAMID BRUSHES for years have been a prime factor in traction accomplishments, so long that they have become a tradition in electric transportation.

Grades 402 and 812 are especially prominent. They are used on many of the largest street railways throughout the country.

These brushes give long life, absence of commutator wear, insure good commutation and reduce maintenance costs.

Our Sales Engineers are eager to serve.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
Cleveland, Ohio San Francisco, Cal.
Canadian National Carbon Co., Limited, Toronto, Ontario

Emergency Service Plants

CHICAGO, ILL.
560 West Congress St.
Phone: HARrison 0143

PITTSBURGH, PA.
7th Floor
Arrott Power Bldg. No. 3
Barker Place
Phone: SMIthfield 0740-0741

NEW YORK, N. Y.
237 East 41st St.
Phone: VANderbilt 0425-0426

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page

A

Ajax Metal Co.... 34
Allis-Chalmers Mfg. Co.... 30
Allison Co., J. E.... 19
Alumino-Thermic Corp..... 40
Amer. Brake Shoe & Fdy. Co.... 37
American Car Co.... 41
American Electrical Works.... 28
American Steel & Wire Co.... 29
Anaconda Copper Mining Co.... 28
Anderson Mfg. Co., A. & J. M.... 30
Archbold-Brady Co.... 19
Arnold Co., The.... 18

B

Babcock & Wilcox Co.... 30
Baldwin Locomotive Works.... 27
Barbour-Stockwell Co..... 29
Beckwith Chandler Co.... 31
Beeler, John A.... 18
Bell Lumber Co.... 40
Bemis Car Truck Co.... 34
Bethlehem Steel Co.... 29
Bibbins, J. Rowland.... 18
Bonney Vehslage Tool Co.... 32
Bridgeport Brass Co...Front Cover
Brill Co., J. G.... 41
Buchanan & Layng Corp.... 19
Buckeye Jack Mfg. Co.... 31
Buda Co..... 29

C

Cameron Electrical Mfg. Co.... 30
Carnegie Steel Co.... 34
Chillingworth Mfg. Co.... 34
Cleveland Fare Box Co.... 32
Collier, Inc., Barron G. Co.... 22
Consolidated Car Fender Co.... 33
Consolidated Car Heating Co.... 32

D

Day & Zimmermann Co., Inc.... 18
Dayton Mechanical Tie Co...20-21
Differential Steel Car Co.... 34

E

Economy Electric Devices Co.... 11
Electric Equipment Co.... 35
Electric Railway Equipment Co. 28

Page

Electric Ry. Improvement Co.... 30
Electric Service Supplies Co.... 9

F

Ford, Bacon & Davis.... 18
Foster Co., L. B.... 30
"For Sale" Ads.... 35

G

Galena-Signal Oil Co.... 13
General Electric Co..14, Back Cover
Gilbert & Sons Brass Foundry Co., A.... 34
Globe Ticket Co.... 24
Godwin Co., W. S.... 30
Gold Car Heating & Ltg. Co.... 33

H

Hale-Kilburn Company.... 25
Haskelite Mfg. Corp.... 23
"Help Wanted" Ads.... 35
Hemphill & Wells.... 18
Heywood-Wakefield Co.... 31
Holst Englehard W.... 18
Hubbard & Co.... 28

I

Ingersoll-Rand Co.... 37
International Creosoting & Construction Co.... 12
International Register Co., The. 32
International Steel Tie Co.... 7
Irvington Varnish & Insulator Co..... 31

J

Jackson, Walter.... 18
Jeandron, W. J.... 33
Johnson & Co., J. R.... 40
Johns-Pratt Co..... 31
Johnson Fare Box Co.... 32

Page

K

Kelly-Cooke Co.... 18
Kerite Ins. Wire & Cable Co.. 28
Kuhlman Car Co.... 41

L

Lapp Insulator Co., Inc.... 28
Le Carbone Co.... 33
Lorain Steel Co.... 29

M

McGraw-Hill Book Co.... 19
McGuire Cummings Mfg. Co.... 37
Metal Safety Railway Tie Co.... 30
Mitchell-Rand Mfg. Co.... 26
More-Jones Brass & Metal Co.... 37
Morton Mfg. Co.... 40

N

Nachod Signal Co., Inc.... 28
National Brake Co., Inc.... 17
National Carbon Co.... 39
National Pneumatic Co., Inc.... 10
National Pole Co.... 6
National Railway Appliance Co.. 33
New York Switch & Crossing Co. 29
Nichols, Lintern Co.... 34
Nuttall Co., R. D.... 25

O

Ohio Brass Co.... 5
Ohmer Fare Register Co.... 32
Okonite Co., The.... 30
Ong, Joe R.... 18
Oskel Equipment Co.... 34

P

Parsons, Klapp, Brinckerhoff & Douglas.... 18
Perey Mfg. Co.... 33
Positions Wanted and Vacant.. 35
Power Specialty Co.... 30

Page

R

Rail Joint Co.... 29
Railway Audit & Inspection Co., Inc..... 19
Railway Track-work Co.... 4
Railway Utility Co.... 33
Ramapo-Ajax Co.... 30
Richey, Albert S.... 18
Robinson Co., Dwight P.... 19
Roebling's Sons Co., John A.... 28
Rooke Automatic Register Co.. 31

S

St. Louis Car Co.... 27
Samson Cordage Works.... 40
Sanderson & Porter.... 18
Searchlight Section.... 35
Shaw, Henry M.... 28
Silver Lake Co., The.... 33
Smith Heater Co., Peter, The.. 31
Standard Underground Cable Co. 28
Star Brass Works.... 34
Stone & Webster.... 18
Stevens & Wood, Inc.... 18
Stucki & Co., A.... 40

T

Thornton Trolley Wheel Co.... 34
Tool Steel Gear & Pinion Co.... 33
Transit Equipment Co.... 35

U

U. S. Graphite Co.... 31
Universal Lubricating Co.... 37

W

"Want" Ads.... 35
Wason Mfg. Co.... 41
Westinghouse Elec. & Mfg. Co. 2
Westinghouse Traction Brake Co. 8
Wharton, Jr. & Co., Wm.... 24
White Engineering Corp., The J. G.... 18
Wish Service, The P. Edw.... 19
Wood Co., Chas. N.... 28
Wortham, Edwin.... 19

SAMSON SPOT WATERPROOFED TROLLEY CORD

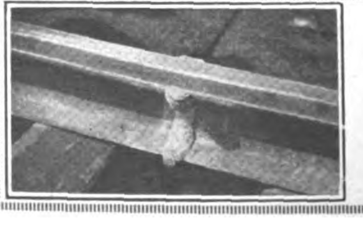
Trade Mark Reg. U. S. Pat. Off.
Made of extra quality stock firmly braided and smoothly finished.
Carefully inspected and guaranteed free from flaws.
Samples and information gladly sent.
SAMSON CORDAGE WORKS, BOSTON, MASS.

100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

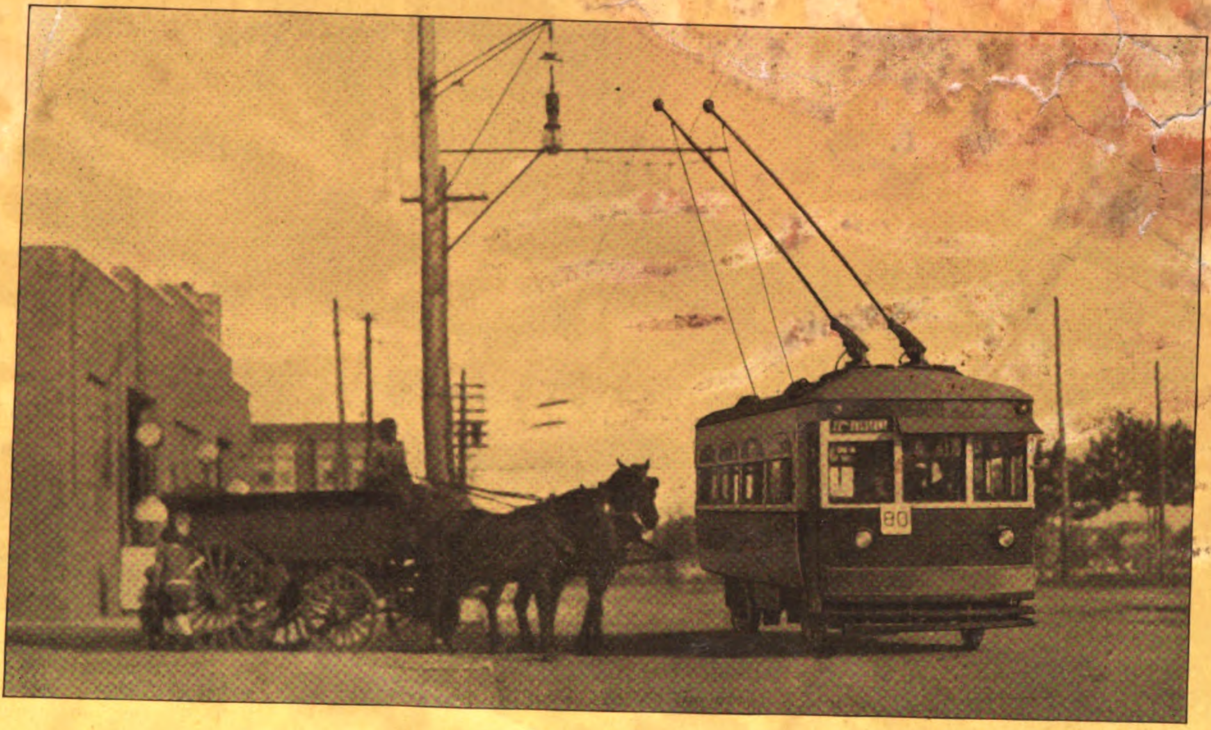
"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

STUCKI
SIDE
BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.



THERALITE
ALUMINO-THERMIC
JOINTS
New and independent process.
No inserts needed. Up-to-date and economical.
Alumino-Thermic Corp.,
Roselle Park, N. J.

Brill Rail-less Cars Serve Philadelphia



Oregon Avenue Installation acting as feeder line to electric railway cars

To Philadelphia goes the honor of having in operation the largest installation of Rail-less Cars in the United States. All cars operated are of the Brill Rail-less street car type, mounted on Brill Rail-less car chasses, equipped with two 25 Hp. motors. They are furnishing transportation over a route which previously was without public conveyance, and act as feeders to electric lines intersecting with Oregon Avenue.

Brill Rail-less Cars offer electric railways a type of equipment capable of meeting the transportation requirements of new territories adjacent to their lines at comparatively low initial and operating costs.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO. — G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO. — WASON MANF'G CO. SPRINGFIELD, MASS.

14 WOODWARD
HOUSE
CENTER
ENTRANCE
CAR
4000
4000

First

"—the first three-car articulated unit placed in service in this country and the first electrically propelled unit of this kind to be placed in operation in the world."

It is significant that for this trial unit, specially designed to handle Detroit's increasing traffic, G-E Motors, Control and Air Brakes were selected.

25-254

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

GENERAL ELECTRIC

Vol. 63, *No.* 16 New York, April 19, 1924 *Pages* 603-642

ELECTRIC RAILWAY JOURNAL

TF
701
.E7

MORRIS BUCK
Associate Editor
C. W. SQUIER
Associate Editor
JOHN A. MILLER, JR.
Assistant Editor
G. J. MACMURRAY
News Editor

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago
MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago
CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 603

Packing Railway Motor Bearings for Oil Lubrication...605
BY C. BETHEL.
Wool waste is most satisfactory for packing, but care must be used to insure feeding the proper quantity of oil. Essentials are to keep shell tight and clearance small. Proper design of the oil grooves is necessary.

Well-Equipped Wrecker Proves Its Worth............609

Maintaining Automatic Sprinklers......................609

Correct Welding Procedure Retains Qualities of Manganese Steel 611
BY HOWARD H. GEORGE.
By use of arc welding in the field, life of manganese steel special work can be increased one to five years. Type of welding rod, technique employed and speed of cooling all affect physical characteristics of welded material.

Portable Pneumatic Equipment Reduces Track Reconstruction Cost 613
BY CLIFFORD A. ELLIOTT.
The expense of ballast tamping and pavement cutting on the Pacific Electric Railway has been cut in half. Greater rapidity is another advantage. Better work is done if the men are allowed intervals of rest. The apparatus used in Los Angeles is described.

Signal for Special Locations..........................615
BY H. J. CHARTERS.

Rolling Door Worked by Electricity...................615

Comprehensive Shop Welding Program Makes Big Savings 617
Reclamation of trucks, motor cases and worn steel wheels and axles in shops of Springfield Street Railway and Worcester Consolidated Railway has materially reduced the waste coincident with the scrap pile.

Ciment Fondu Proves Unsuccessful for Grout.........618

Compromise Joint Plates Made by Welding Shims to Angle Bars 619

Commercial and Research Department Feature Pittsburgh Organization 620
A district sales organization with executive powers has been formed to cover fares, service and relations with the patrons. Research department will be source of data for all other departments.

Equipment Maintenance Notes 624

Association News and Discussion 629

American Association News...........................630

News of the Industry..................................631

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

MEMBER ELECTRIC RAILWAY ASSOCIATION AERA 1924

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingenieria Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

Copyright, 1924, by McGraw-Hill Company, Inc.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

The Reaction on the Contrib

IN A SHOP that had been a fruitful source of Maintenance Notes, a JOURNAL editor recently appeared on the scene looking for further material of the same interesting and helpful character. On greeting him the master mechanic offered this comment:

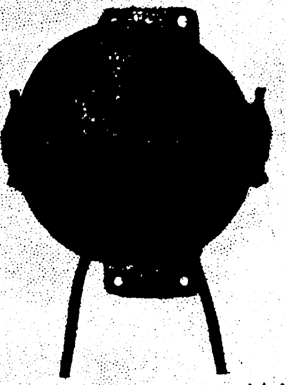
"We have been kept busy trying to live up to the reputation that seems to have gotten around that we are conducting a very progressive shop. That's a good reputation to have, but it's easier to improve a poor shop than it is a good one. However, we have a couple of new schemes to tell you about."

This is a by-product of the JOURNAL'S work that is not generally considered. The editors are anxious to describe methods that have produced good results. If, in addition, the publishing of stories about new maintenance practices leads the men originating them to make further effort in order to maintain their reputation for progressiveness, the JOURNAL is certainly serving railway officials and the public in an effective way, for it means a continuously improving record of costs and service.

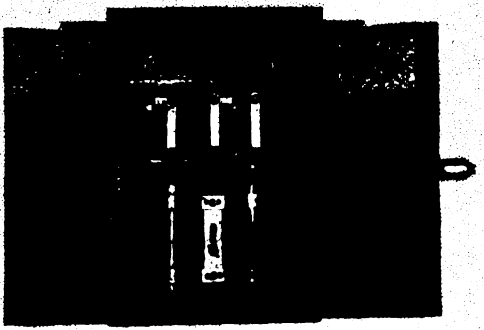
Number of Copies Printed, 7,300 **Advertising Index—Alphabetical, 64; Classified, 60, 62; Searchlight Section, 59**

Westinghouse Railway Lightning Arresters

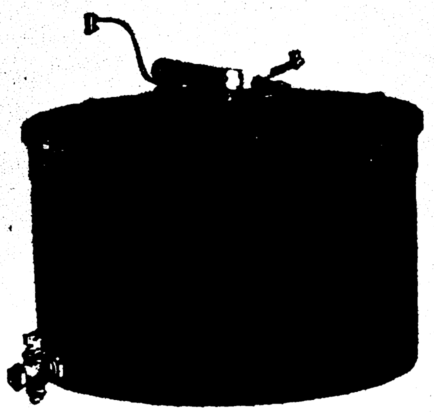
Meet every requirement for the Car, the Line and the Station



MP Arrester, 100-750 Volts



Type AR Electrolytic Arrester
For Voltages up to 3800



Type A Electrolytic Arrester
For Voltages up to 2500

The MP Arrester is still the standard after 20 years of meritorious service. The 1924 model has an improved housing suitable for either indoor or outdoor mounting on the car, on the pole or in the station. A single design meets all applications.

Type AR Electrolytic Arrester is a direct-current arrester for car or station use. The arrester should be used for each 500 kilowatts of feeder bus, converter or motor-generator capacity.

The arresters are mounted, and securely held in asbestos lined cypress boxes. For mounting beneath the car the boxes have a flat top. For mounting in the station, or on the car roof, or for outdoors, the boxes have a slanting roof.

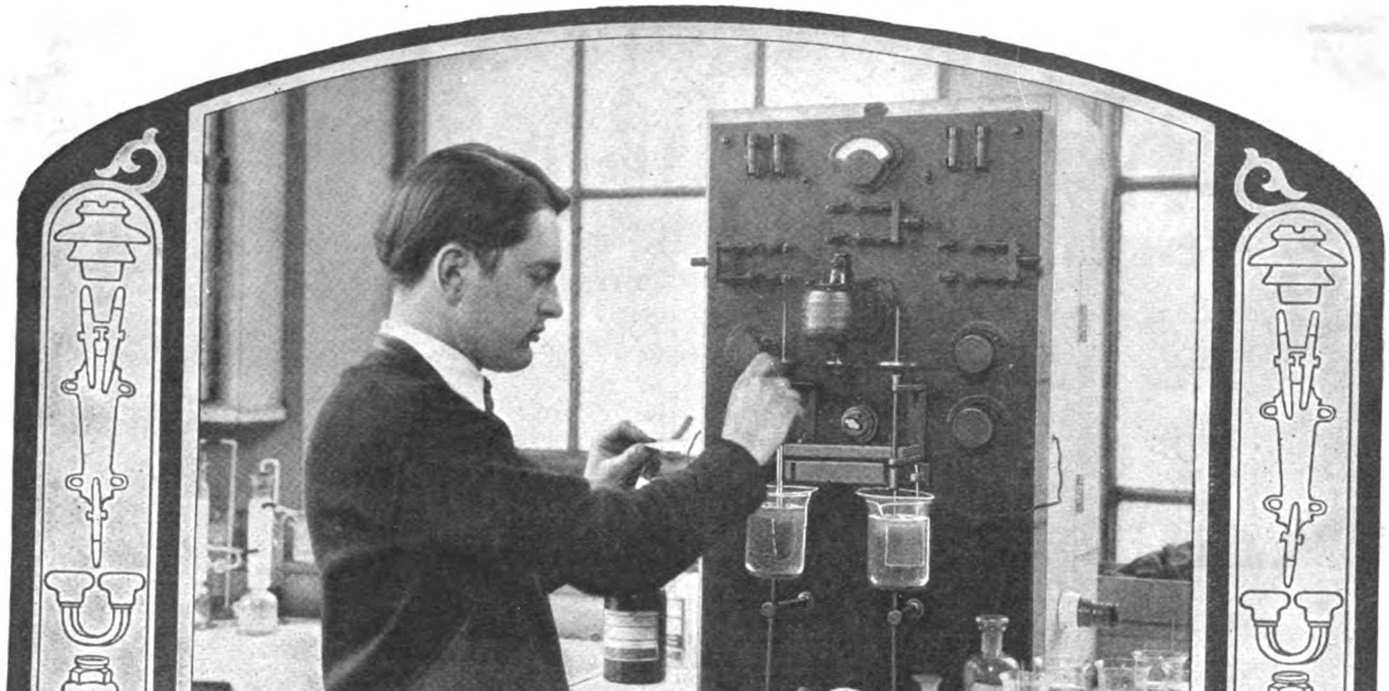
Type A Electrolytic Arrester has a greater discharge capacity than the AR arrester and is used most extensively in substations. The area of aluminum tray wetted by electrolyte is several times that of any other aluminum-cell arrester. It has the greatest discharge capacity of any direct-current arrester, and is not limited to any particular kilowatt capacity of circuit.

Descriptive Leaflet 20021 and 20022 gives full particulars.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse



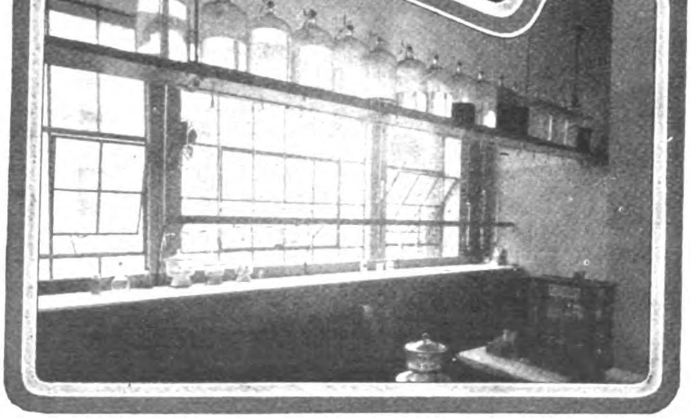
What Is in O-B Bronze?

That question is answered accurately each day—on each foundry heat of O-B Bronze. The man shown above is making an electrolytic determination of the amount of the copper and lead in O-B Bronze.

This test as well as checks on the other constituents of the bronze by chemical analysis are made on samples taken from each foundry heat.

There are certain chemical standards set by the Technical Department which must be maintained and these are checked on the metal as poured and by close supervision of foundry practice.

This procedure is followed on all the raw materials that go to make O-B Products for the electric railway industry. The Chemical Laboratory is just one phase of the Technical Control that establishes a high standard for O-B Products and keeps it high by close supervision in cooperation with the Manufacturing Department.



THE OHIO BRASS CO.
Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE

Mr. Steward said "Of course"

At a recent meeting of the New England Street Railway Club, Mr. H. M. Steward, superintendent of maintenance, Boston Elevated Railway, made an address on track appliances and practice. He said this:

> ***"Of course welding machines, * * * grinders are used"***

"Of course" the world's leading electric railway systems (including the Boston Elevated Railway) chose the welding and grinding equipment shown on this page.

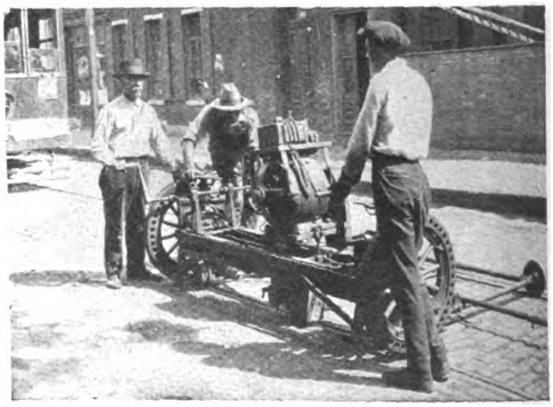
Details? Certainly!
Yours on request

Railway Trackwork Co.

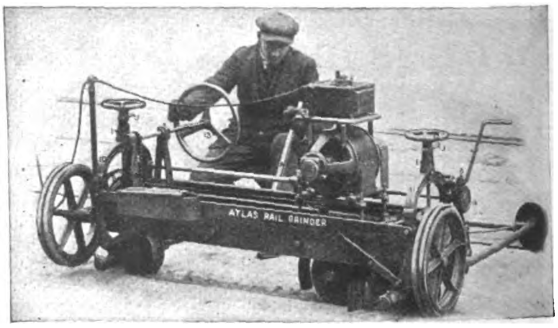
3132-48 East Thompson Street, Philadelphia

AGENTS:
Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & M'f'g. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London

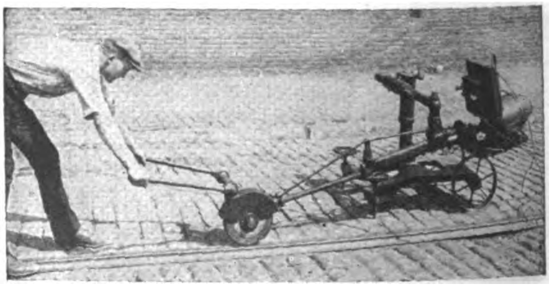
"Reciprocating" Track Grinder



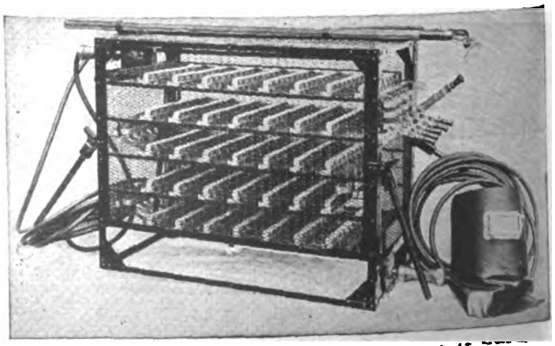
"Universal" Rotary Track Grinder



"Atlas" Rail Grinder



"Hercules" Swing Frame Rail Grinder



"Ajax" Electric Arc Welder

Steel Twin Tie Track

Heavier than Air Facts on STEEL TIE TRACK

First Installation 1910, Altoona—Open Track—Service; 20 ton cars, fifteen minute headway for nineteen hours per day. Engineer says: "There is no apparent deterioration with Steel Ties."

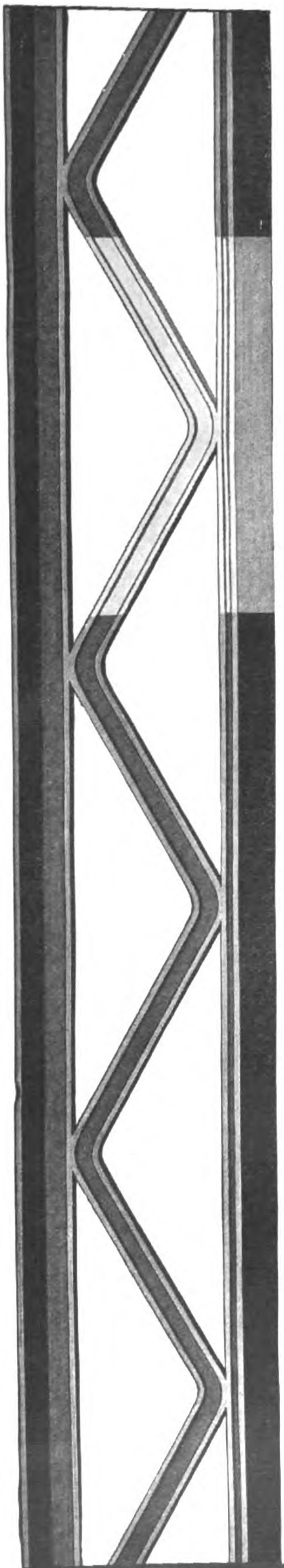
Installation Anderson, Indiana, 1911—City and Interurban.—Traffic check 13,458,960 ton-wheels. Engineer says: "None of track shown, nor any of this type of construction on our property, has cost anything for maintenance since it was installed."

Our largest and oldest user (first installation 1911) has standardized on Steel Twin Ties for all new construction and reconstruction.

A two year old test renewal installation has demonstrated that new rail and paving may be placed on old Steel Tie Foundation.—34th Street Bridge, Broadway Line, Cleveland, Ohio.

Write for proposal folder,
including delivered price

The INTERNATIONAL
STEEL TIE COMPANY
CLEVELAND, OHIO



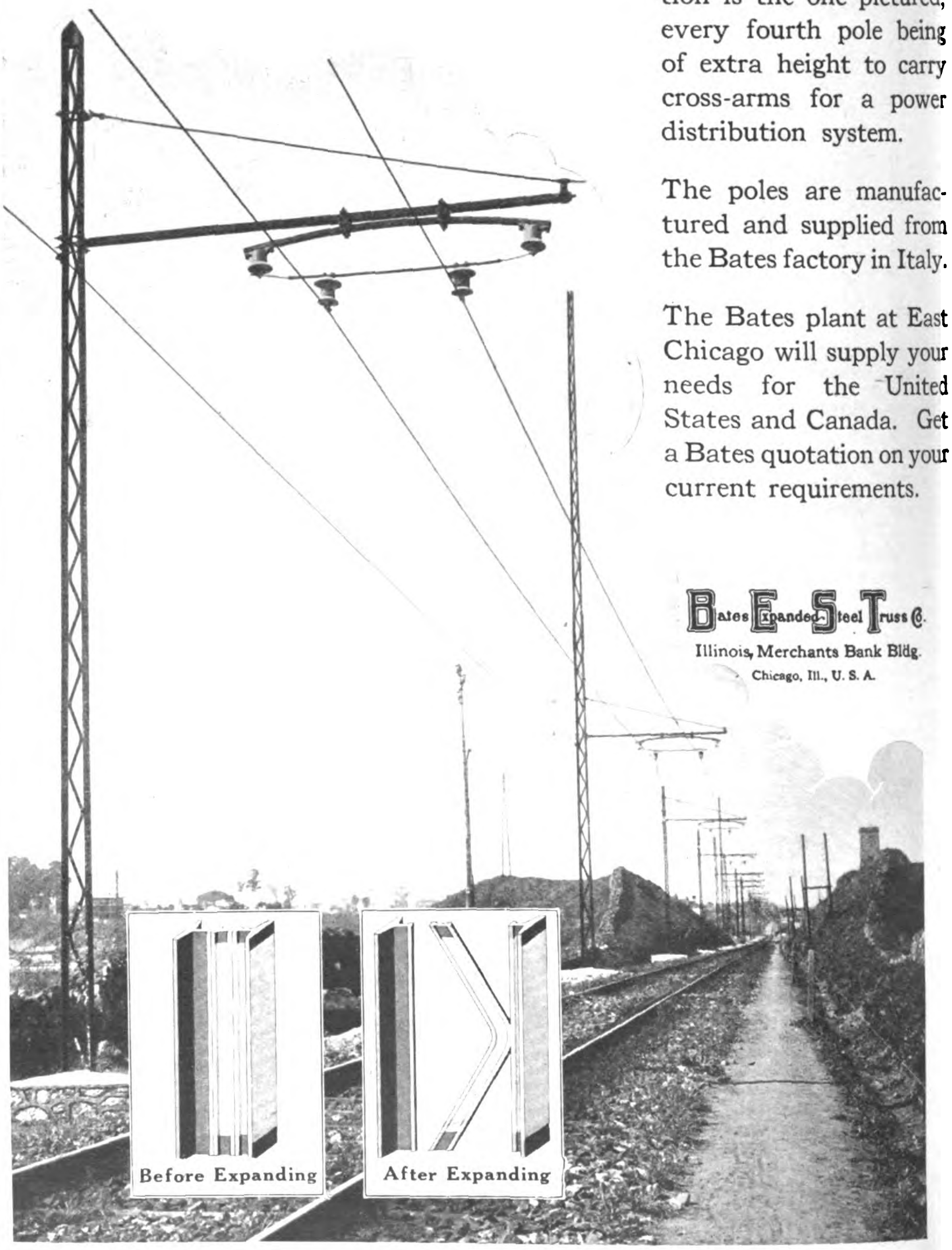
Italian State Railway Bates Pole Equipped

Splendid construction on Bates Poles is to be found throughout Italy on the Italian State Railway. An interesting installation is the one pictured, every fourth pole being of extra height to carry cross-arms for a power distribution system.

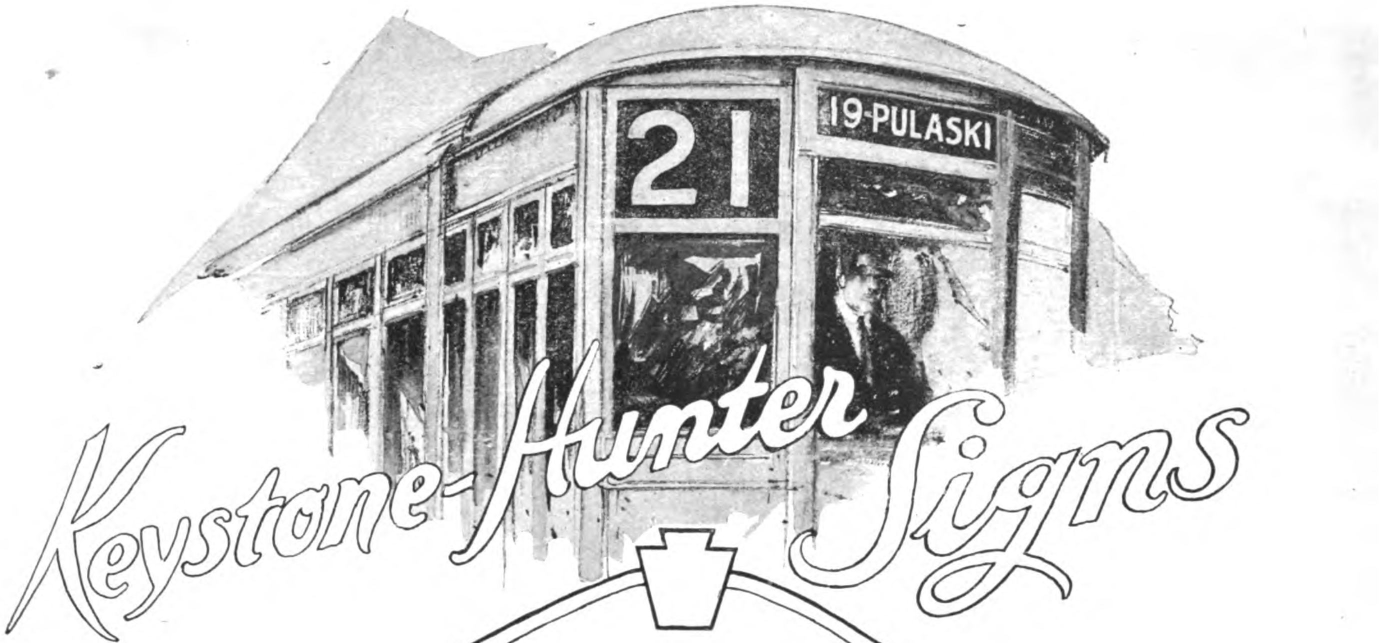
The poles are manufactured and supplied from the Bates factory in Italy.

The Bates plant at East Chicago will supply your needs for the United States and Canada. Get a Bates quotation on your current requirements.

Bates Expanded Steel Truss Co.
Illinois Merchants Bank Bldg.
Chicago, Ill., U. S. A.



BATES ONE PIECE EXPANDED STEEL POLES

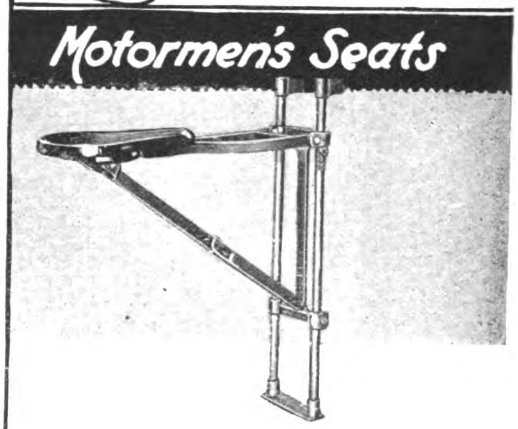

21
19-PULASKI
Keystone-Hunter Signs

International Registers
ELECTRIC SERVICE SUPPLIES CO
104
IN
00781

International Fare Registers have been standard equipment on many electric railways for over 20 years. Their simplicity, accuracy, and rugged durability recommend them.

Leading
Car Equipment
from the
KEYSTONE
List

Catalog
No. 7


Motormen's Seats

Made for utmost comfort. Provided for adjustment to motorman's height. Require minimum platform space when not in use. Made in both stationary and portable types.

Keystone-Hunter Car Signs

Tell the public where your cars are going—and by what route! Make the cars tell their story two blocks away. The intending passenger may wait if he can see his own car coming, instead of taking the ever-present taxicab or the shabby jitney.

Advertise your own service—
with Keystone-Hunter Signs

ELECTRIC SERVICE SUPPLIES CO.

Manufacturer of Railway Material and Electrical Supplies

PHILADELPHIA
17th and Cambria Streets

NEW YORK
50 Church Street

CHICAGO
Monadnock Bldg.

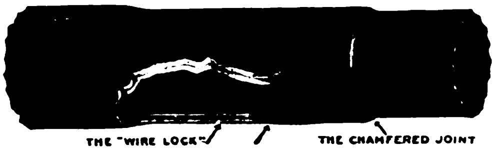
***Branch Offices:* Boston, Scranton, Pittsburgh**

Canadian Distributors:
Lyman Tube & Supply Co., Ltd.,
Montreal, Toronto, Winnipeg, Vancouver

SPAN WIRE
E.R.E.Co.

ELRECO POLES

Lowest Cost
Least Maintenance
Lightest Weight
Greatest Adaptability



Elreco Tubular Steel Poles

Joints 100% Efficient

Our patented wire lock swedge joint gives the tubular steel pole unquestioned superiority for electric railway service.

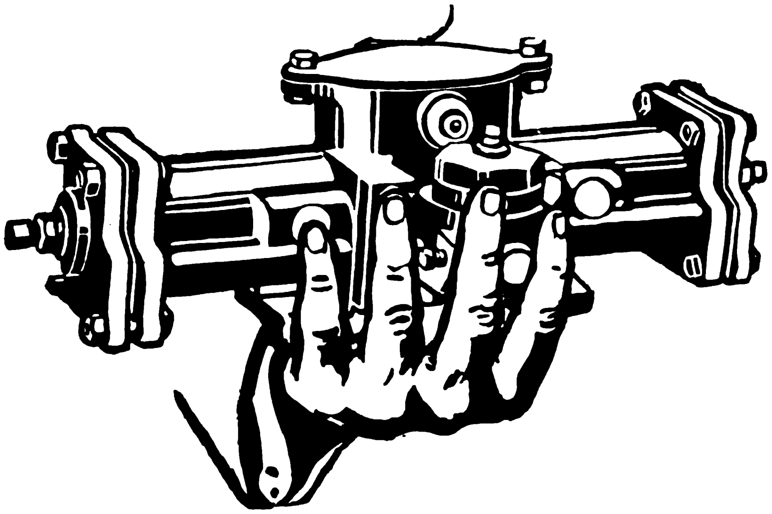
The circular cross-section of a tube develops maximum strength in all directions, and this patented joint construction makes the joints equally strong. They are non-telescoping and non-collapsible.

Note the chamfered edge which prevents the collection of moisture and dirt at the joint, thereby making it corrosion-proof.

Specify Elreco Tubular Poles

Electric Railway Equipment Co.
Cincinnati, Ohio
New York City, 30 Church Street

SPAN WIRE
E.R.E.CO.



CONCENTRATE

on rapid economical passenger interchange

That is the big problem in present-day transportation.

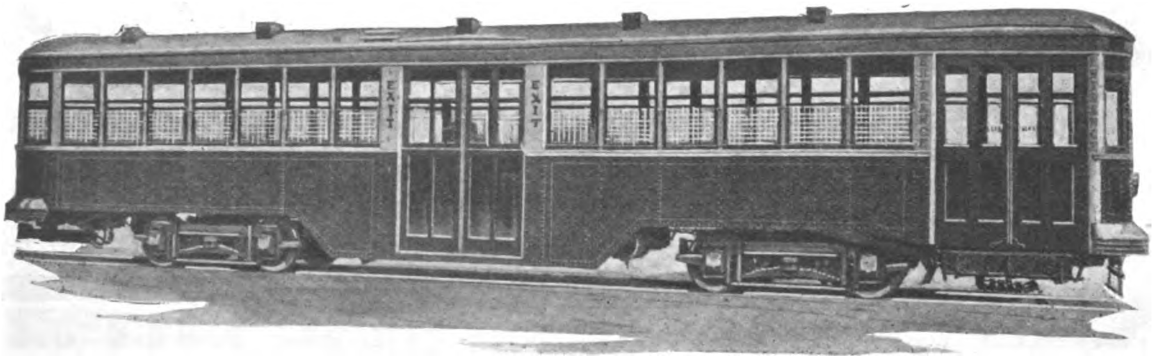
And it is being successfully solved on more than 65,000 cars today by National Pneumatic Equipment.

Thinking men in the electric railway industry, as in every other industry, are realizing that manual operation does not, and cannot pay, on jobs that can be done mechanically.

Door operation is one of these jobs. Consult us for details of—

NATIONAL PNEUMATIC DOOR and STEP CONTROL

National Pneumatic Co., Inc.
Originators and Manufacturers
***Principal Office:* 50 Church Street, New York**
Philadelphia—Colonial Trust Building Chicago—McCormick Building
Works—Rahway, New Jersey
Manufactured in Canada by Dominion Wheel & Foundry Co., Ltd., Toronto, Ont.

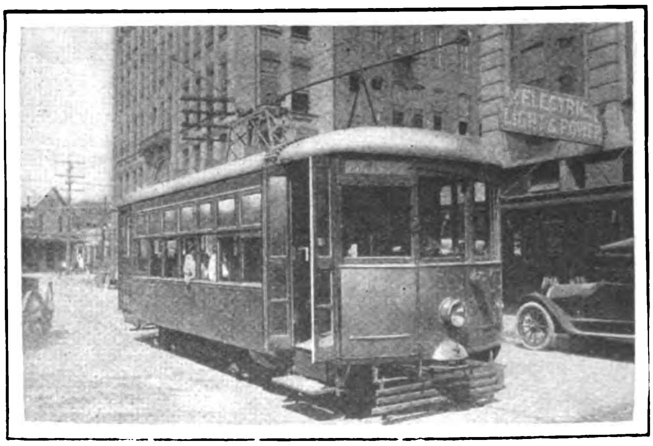


DEFINITION OF A SAFETY CAR

"Any type of car equipped with *adequate* Safety Devices for one-man operation."

A.E.R.A. Committee on Safety Car Operation, 1921.

Safety Cars—

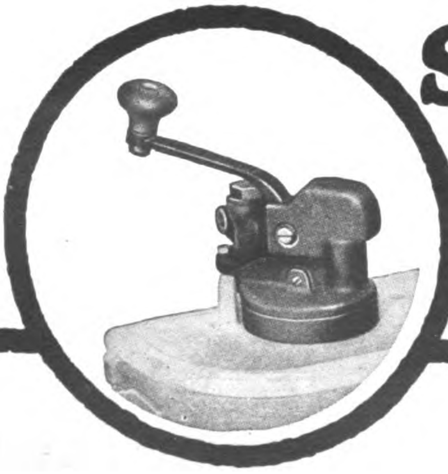


"Earn More by Saving More"

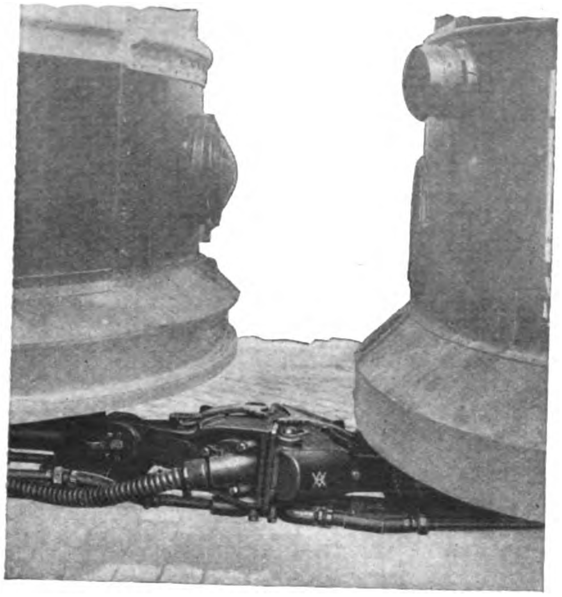
Safety Cars are notably successful because they render safe, efficient, high-class service at less expense to the railway.

They increase net earnings by reducing operating costs.

We furnish the Air Brake and Safety Car Control Equipment which **makes** the Safety Car. If you are contemplating the purchase of new cars the question of equipping them for Safety Car service should be thoroughly considered. Your old cars can also be made to show higher profits by the installation of our devices.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

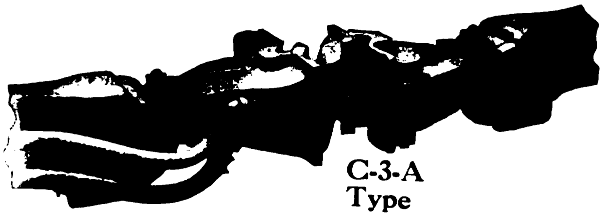


K-1-A Type

WESTINGHOUSE

Automatic "Tight-Lock"
car, air and electric

COUPLERS



C-3-A Type

Popularity Well Earned!

3 Sizes

Westinghouse Automatic Couplers are furnished in three separate sizes to meet the requirements of all classes of service—the "H" type for heavy, high-speed cars, the "K-1-A" for light and medium-weight cars and the "C-3-A" for light cars in cases where the electric feature is not required.

The desire for a thoroughly practical and dependable automatic car coupler was fulfilled with the development of the famous Westinghouse "Tight-Lock" models.

These couplers, car-air and car-air-electric, have been used extensively for many years. They have not only enabled many companies to surround their employees and their passengers with greater safety, but have also saved many precious minutes in train make-up at terminals and at junction points, where single incoming cars covering separate routes are quickly coupled together and speeded through the congested business center as a solid train.

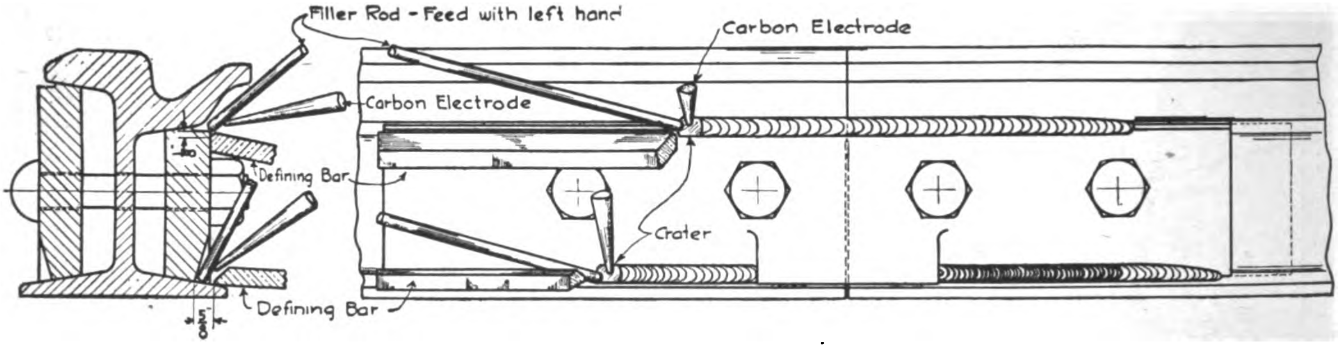
The two vital factors of safety and time-economy are realized to the fullest degree by the use of these couplers. Specify Westinghouse "Tight-Lock."

Westinghouse Traction Brake Company
General Offices and Works: Wilmerding, Pa.

TRADE MARK

WESTINGHOUSE TRACTION BRAKES

Welding and—UNA Joint Welding



IN a rail bond, for instance, the mere fusion of rail, plate and filler rod is not necessarily a good weld, that will stand up under service. Aside from the proper set-up of the joint, the properties of the seam metal must be such that it will withstand the stresses to which it is subjected.

In the Una Process of welding this fact is not left to chance, but the details of the welding process, as well as the composition of the filler rod determine the properties of the weld metal.

The length of each seam, the fillet effect, the staggering of the seams and plates shown in the sketch, serve a very definite purpose in producing a joint with the life of the rail itself.

By means of the carbon arc it is a simple matter to pre-heat the rail and plate as the seam is welded. Then the post-heating of the seam metal with a long arc (similar in many respects to the results obtained in the heat-treatment of steel) is merely a matter of seconds. To strengthen the seam and to still further refine the metal at the points subjected to greatest stress is easily accomplished by double welding.

Each detail of the Una Process is based on the results of research and testing. There is a definite reason for each step. The Una Process of joint welding produces a weld that withstands the stresses of the joint in service.

A recent bulletin "Operating Instructions for the Preparation, Welding and Grinding of Una Joints" discusses in detail the Una Process of Welding. Every welding operator should have a copy.

UNA
RAIL JOINTS

RAIL WELDING & BONDING COMPANY, Cleveland, Ohio

Manufacturers of

UNA RAIL BONDS

THE SIGNIFICANCE TO *YOU* OF THE MEMBERSHIP OF THE

Electric Railway Journal

IN THE ASSOCIATED BUSINESS PAPERS, INC.

YOU depend upon the Electric Railway Journal for an unbiased and accurate report of all news affecting your business interests.

Probably, too, you give heed to its editorial counsel in many matters of considerable consequence. You have a right, therefore, to know about the policies and principles back of the important service rendered by Electric Railway Journal.

The membership of this publication in The Associated Business Papers, Inc., means that it has achieved an exceptionally high publishing standard, and has subscribed unreservedly to these—

STANDARDS OF PRACTICE

The publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—

1. To consider, first, the interests of the subscriber.

2. To subscribe to and work for truth and honesty in all departments.

3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.

4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"

5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.

6. To solicit subscriptions and advertising solely upon the merits of the publication.

7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper and authentic verification.

8. To co-operate with all organizations and individuals engaged in creative advertising work.

9. To avoid unfair competition.

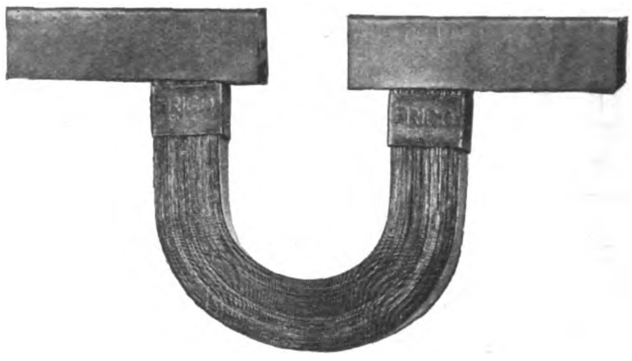
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

If you have read the foregoing standards, there is not much left to be said, except to tell you that these principles are *present day realities* and not merely beautiful ideals for future attainment.

THE ASSOCIATED BUSINESS PAPERS, INC

The International Association of Trade, Technical and Class Publications

220 WEST 42ND STREET NEW YORK CITY

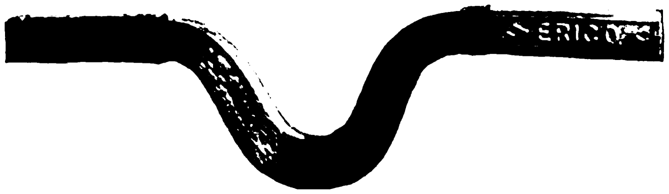


TYPE ET

Laminated bond for ball of running rail. Shape and size varies for single or double bonding, to meet any usual rail drilling.

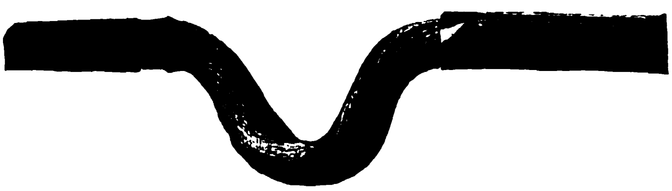
ERICO Brazed Bonds

A type for every track condition



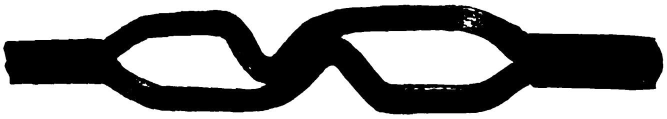
TYPE EA

Laminated Brazed bond for ball of running or third rail.



TYPE EA CHAMPION, ROPE LAY CABLE

Stranded or rope lay cable bond for ball of running rail. Variations of this type, single and double bonding for third rail work



TYPE EC

Concealed laminated bond for standard tee and girder rails

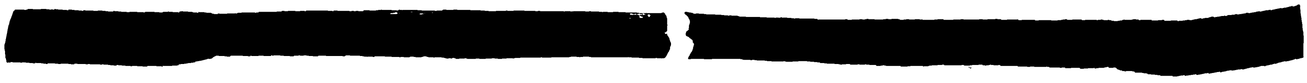
For general use in bonding the head of the rail, Type ET and EA have amply demonstrated their value as permanently conductive bonding. Type EC is used for bonding the web of the rail, lying concealed under the fish plates. When rail joints have some play due to road bed conditions, and where medium weight equipment, in one or two car trains are run at moderate speeds, these laminated conductor bonds cannot be excelled for long life and conductivity.

Type EA Champion stranded or rope lay cable bonds are designed to meet the vibration conditions produced by very high speed heavy multiple unit trains. The tightly interwoven wires of the stranded or rope lay cable conductors damp the high frequency, low amplitude vibrations, and so prolong the original crystalline rolled structure of the copper, the preservation of which measures the life of the bond conductor.

When properly installed no Brazed Bond Terminals can ever become detached from the rail except by actual mutilation.

Sample brazed terminals and complete proposal on request.

The Electric Railway Improvement Co.
Cleveland, Ohio



TYPE E

Cable bond for cross bonding and bonding special work

QUALITY-SERVICE-ECONOMY
G O S
GALENA OILS

Electric Railway Lubrication

Materials + Service = Lubrication

Buying and using plenty of oils and greases doesn't necessarily mean efficient lubrication. On the other hand, the most careful supervision and control of the use of oils and greases will not avail if poor or unsuitable materials are used.

Efficient lubrication, is the proper combination of the right materials with intelligent service.

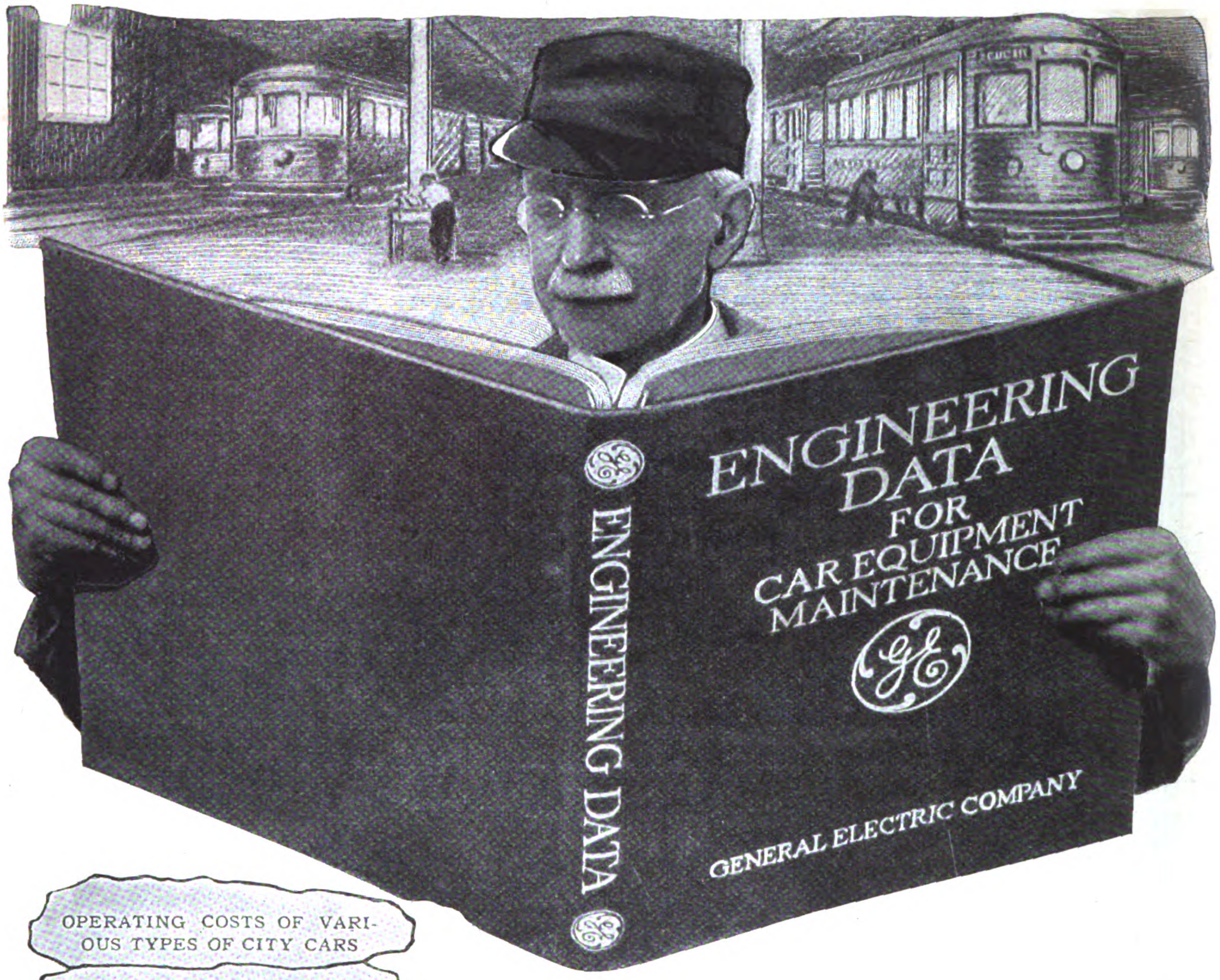
This is why

GALENA LUBRICATION
best meets railway requirements

Our experts are in constant touch with every phase of railway operation and maintenance. Our records include statistics and costs from hundreds of railway companies. Our products—Galena Oils and Greases are the finest that can be compounded, always uniform, clean and unvarying.

Let Galena Lubrication be the standard in all departments—power, shop, rolling stock, and track. The Galena standard means best results at lowest cost.

Galena-Signal Oil Company
New York Franklin, Pa. Chicago
and offices in principal cities


ENGINEERING DATA
ENGINEERING DATA FOR CAR EQUIPMENT MAINTENANCE
GENERAL ELECTRIC COMPANY

OPERATING COSTS OF VARIOUS TYPES OF CITY CARS

Caring for D-C. Aluminum Car Arresters During the Winter

Testing of Railway Motors

ADJUSTMENT OF DRUM CONTROLLER FINGERS

Roof Wiring for Circuit Breakers

Repair of Railway Motor Commutators

Methods of Removing the Armature from Box-frame Railway Motors

Your Guide
to Car Equipment Maintenance

The electric railways have long appreciated the assistance afforded them by the special G-E Renewal Parts Catalogs supplied for years with G-E Equipment.

They regard their big G-E Railway Supply Catalog as an aid particularly in establishing proper standards.

Much other information, in various forms, has gone out as helpful suggestions to those directly in charge of the upkeep of equipment. This particular service will be continued, but is being still further improved. It is now centralized in the G-E Engineering Data Book which becomes your permanent guide to proper operation of car equipment and its maintenance.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

40-345

GENERAL ELECTRIC

New York, April 19, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

Volume 63
Number 16

Possible City Operation for New York, but with Service at Cost

AT THE present time it is somewhat difficult to forecast all the effects of the rapid transit bill passed in the closing hours of the hectic session of the New York State Legislature, recently adjourned. It came about through a compromise effected by the Governor between the divided houses of the Legislature, which resulted in the passage of a measure giving a modicum of home rule to New York City. It is something of an empty victory for Mayor Hylan, for while his opponents apparently weakened at the last moment and permitted the bill to pass, it allows far less transfer of authority to the city than had been demanded. The compromise plan, however, had the approval of Governor Smith, and he presumably will sign it.

The salient feature of the act is the creation of a new Board of Transportation of three members, to be appointed by the Mayor, who will have authority to undertake the planning and construction of new rapid transit railroads. These lines may be operated by the city if it so elects, under conditions which are outlined in the bill. If such operation is undertaken it must be at a 5-cent fare for the first three years. But if, at the end of this period, the 5-cent fare is not sufficient to make the lines self-supporting, including interest, depreciation and amortization on a ten-year basis of any traction bonds issued, a rate of fare must be adopted that will cover the cost of the service. It is obvious that a large deficit can be incurred in this initial three-year period of operation, judging by the results of the companies now attempting to give service on a 5-cent fare on the old-established lines with the densest traffic in the world, and constructed when costs were much lower than at present. Thus in effect an increase in fare has been legislated—if, indeed, any substantial subway construction is actually done. This prospect of higher fares will hardly be an incentive to the Mayor to push construction. He will more likely continue to stall.

It is unfortunate from the standpoint of real rapid transit that there is nothing in the act requiring the operation of any new lines that may be built in conjunction with those existing. Newspaper stories have it that it is the plan of the present city administration to make its new construction entirely independent, financially and physically, from the old systems, so that it will not have any connection with the private companies. This naturally will lead to the duplication of facilities and fares, so that the relief promised so often in political speeches if the "traction barons" were beaten would be much like the disintegration of the surface systems resulting from the Mayor's activities in that direction.

On one point the Mayor was beaten decisively. He asked for control over the existing lines and abolition of the State-appointed Transit Commission created under the Miller plan of 1921. Here his opponents did not yield, leaving the old lines in control of the Transit Commission. Thus there will be two commissions instead of one, and, if the construction program is carried out, three rapid transit systems instead of two, neither of which things is likely to work for the best interests of the city. But it appears that at least the construction of new subways is now put squarely up to the Hylan administration.

How Much Oil per Bearing?

THE amount of oil required properly to lubricate an armature, axle or journal bearing of an electric railway car is very small, and yet it is extremely difficult to keep these parts continually lubricated. If the bearing housing has a satisfactory height of oil when the car leaves the shop, this oil is drawn up through the waste by the turning of the shaft or axle, so that after a run of an hour or two, this oil height is frequently reduced to one-third of its original value. All of the oil does not go to flood the bearings, however, and if the car is withdrawn from service, the oil will return nearly to its original level, as the bearings cool off. Modern motors are designed with an overflow pocket to take care of any waste oil.

When a car goes into service after oil has been added to the bearing chamber to bring the level to a maximum height, the amount of oil used at the start will be much greater than at the end of its run. The article by C. Bethel in this issue gives some very interesting data in regard to the relations between lift and feed of oil with wool waste. The maximum lift which can be depended upon to give a safe oil supply is found to be 3 in. While most modern railway motors are provided with an oil well separate from the waste packed portion, in most cases it is unsafe to run the motor until the oil level nears the bottom of the oil well. This fact has led some railways to make tests to determine the most economical as well as the safe height to keep the oil. In considering economy, however, the amount of oil used should be kept well above the danger point of hot bearings.

In a test on the eight identical armature bearings on the same car the amount of wear resulting was measured under use of varying amounts of oil. The amount of oil supplied per bearing varied from 1.96 gills to 0.42 gill per 1,000 miles. The wear on the bearings supplied with 1.75 gills or more of oil per 1,000 miles showed no appreciable wear, while the bearing with 0.42 gill showed wear of 0.038 in. after one month of operation, or 3,600 miles. In other words, one-sixth to one-quarter of its life had been used up.

Cost of One Hot Bearing Would Buy Oil for Entire Life of Car

ANOTHER point that is sometimes not thoroughly appreciated is the total cost involved in a hot bearing. A careful analysis on one railway shows the average cost for a hot armature bearing to be $89. This amount includes only the actual cost of making repairs, and does not take into consideration the loss in revenue due to withdrawing the car from service, or the loss of good will from inconveniencing passengers and interrupting service. Other analyses indicate an average cost of $100 to $125 for a hot bearing.

The cost of $89 for one hot armature bearing would pay for 523 gal. of oil at 17 cents. Here is what this means. With an average consumption of 1 gill of oil per 1,000 miles per bearing, and considering a two-motor equipment with four armature bearings, four axle bearings, and eight journal bearings, this amount of oil would be sufficient to lubricate the car bearings while it operates over 1,000,000 miles, or through a period of 25 years—the life of the car, or more. Lubrication costs, viewed in terms of hot bearings, are startling. The point serves to emphasize the value of using good lubricating materials and plenty of them.

How Not to Repair Special Trackwork

THEY'RE digging up the intersection at X Street and Y Avenue again. That's the sixth time it has been opened in the past year, just to tighten up a few bolts, weld a little metal on the manganese inserts, weld on a few more plates, and patch things up generally so that the cars can get across the intersection without jumping the track. Once again the crossing will be placed in shape to serve for a few months more.

Every time the track is torn up the cars are delayed while the men working on the job climb out, and the men are delayed while the cars go by. And street traffic must go around the opening and the piles of earth and paving dug out of the track.

Anybody with half an eye can see that the hard centers are worn, battered and broken practically beyond effective repair. They have been welded and rewelded until they look like they had a severe case of smallpox. The body of the special work is worn so that no insert could be made to fit. The men don't even try to make them fit, but just weld in a little metal so they will stick together.

If the road were to be abandoned, this policy wouldn't be questioned. But there is every indication that street cars will continue to be needed indefinitely, and this intersection is where two important thoroughfares in a big city cross. How many more times the intersection can be patched up before it finally falls to pieces so that it has to be taken out is hard to tell, but judging from the past the evil day will be put off as long as possible.

The worst of it is that too much track repair work is done this way and the track superintendent thinks he is doing a good job and saving money for his company.

But if cost figures could be assembled it is probable that it would be found that enough has already been spent here to pay a large part of the cost of a new intersection. There comes a point in depreciation beyond which it is poor economy to continue to spend money in making further repairs instead of a replacement. Obviously, when it has become necessary to open up an intersection six times in one year, this point has long since been passed. This is true from the point of view of the track man alone, but in addition to that, were enough of an appropriation made to do a real job, the result would be reflected in lower maintenance of cars, fewer delays to the service and enhanced good will of riders and other users of the street.

Pittsburgh Company Sets Out to Sell Its Product

THE term "selling transportation," as applied to American electric railways, is apparently finding its most concrete expression in the recent establishment of a "commercial department" by the Pittsburgh Railways, to function along the lines of an executive organization and with broad scope and powers, as set forth elsewhere in this issue.

The fare schedules in the Greater Pittsburgh district are probably the most diverse in America because of the nature of the territory and the variety of communities served. No better example could have been found for the application of commercial principles because apparent inequalities will always exist under any fare plans that can be devised. It is therefore well that the solution of the many problems should be left to an organization which starts from the angle of more net from sales instead of more net from skimped service, and one that is freed of all production responsibilities.

Quite naturally, the commercial department absorbs the publicity and public relations work that is found today on many other electric railways as a sort of appendage to the general manager's or transportation superintendent's office. In Pittsburgh the temporary smoothing over of a complaint will go hand in hand with whatever fare and service changes can remove that complaint permanently. This means plainly that the commercial department is an executive organization responsible for many decisions and functioning in relation to the general manager, as does the sales manager of a department store, for example, to the general manager of that store. The latter does not set the prices for the sales manager. He merely demands that the net result shall be in black instead of red. So will it be in Pittsburgh. The commercial department is the one that within a wide range of discretion will set rates and standards of service. The transportation department's job is that of producing the goods requested with least expenditure in men and equipment.

The variety of things started by the commercial department in its first ten weeks of activity shows what it is to have an organization of genuine sales responsibility. This department must be ever on the *qui vive* for business, and it must have no more hesitation about trying new rates at frequent intervals than has the merchant who not only varies his prices with quality, quantity and the seasons, but also with the days of the week. It is just this flexible adjustment to its business opportunities that has been so sadly lacking under the rigid fare and service plans of this country. Now that one of our greatest city and interurban systems has shown that it means to use merchandising principles in selling rides, the industry may have some practical demonstrations of this much talked of theory that will be very helpful.

Packing Railway Motor Bearings for Oil Lubrication

Wool Waste Is Most Satisfactory for Packing, but Care Must Be Used to Insure Feeding the Proper Quantity of Oil—Essentials Are to Keep Shell Tight and Clearance Small—Proper Design of the Oil Grooves Is Necessary

By C. Bethel
Railway Motor Engineer Westinghouse Electric & Manufacturing Company

A Long Strand Wool Wick Such as This Should Be Prepared for Feeding Oil to the Bearing Window

RECENT tests, both in the laboratory and in service, made to determine the main factors affecting the operation of waste-packed bearings have had results defining quite clearly the factors necessary for successful bearing operation. When the bearing is correctly packed with a good grade of long strand wool waste, the oil level is kept within the correct limits, and reasonable care is taken to exclude dirt and to maintain the clearance, the useful life of the bearing can be greatly extended.

The condition of the bearings in a railway motor determines more than any other one thing the amount of general maintenance necessary. With bearings in good condition and with close clearances the motor maintenance resulting from abnormal vibration will be low. Taking advantage of all that is now known regarding the action of waste-packed bearings, a material improvement in bearing life should be obtained over average practice.

Modern waste-packed bearings are rugged and reliable; in fact, they are so simple that the underlying principles of their operation are likely to be overlooked. Although bearings are commonly regarded as performing satisfactorily if they run cool, this is not a reliable index of good bearing operation. Sufficient oil may reach the bearing to keep it from getting hot, but still a rapid wear of the bearing may take place. The mileage of railway motor bearings has been found to vary from 50,000 to 250,000. Some of this difference is, of course, due to differences in service, but most of it is due to variations in lubrication and bearing practice. The waste-packed bearing consists of a babbitt-lined bronze shell which is pressed into the motor housing and is provided with a window into which the waste is packed. This waste communicates with an oil chamber in the housing and carries oil by capillary action to the journal. This is the only source of oil supply.

A certain amount of wear will be present with the best of lubrication. This wear is an inverse function of the amount of oil supplied to the bearing. Therefore, first consideration should be given to the oiling of the bearing. The amount of oil required to lubricate the bearing properly depends on the size of the bearing and the work that it does. The amount of oil that the bearing actually gets depends on (1) the kind of waste used; (2) the height of lift, i.e., the distance from the oil to the window; (3) the kind of oil used, and (4) the quantity of waste carrying oil to the window.

Many tests made to determine the capillary characteristics of different grades of waste and other packing materials have brought out a number of interesting characteristics. For example, the ability of four common materials to lift oil is in the following order: (1) Lamp wick; (2) cotton waste; (3) felt, and (4) wool waste, the latter being the poorest in this respect. This

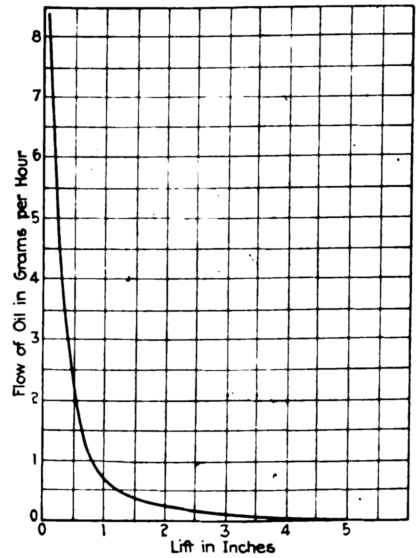


Fig. 1—This Curve for a 40-Hp. Motor Shows the Decrease of Oil Flow with the Lift

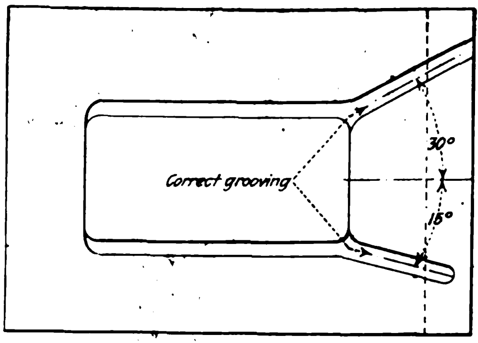


Fig. 2—An Arrangement of Oil Grooves with Edges of Windows Chamfered that Has Proved Satisfactory

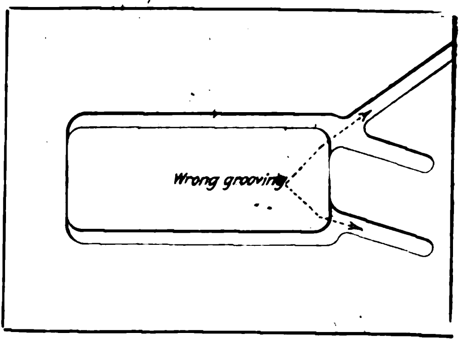
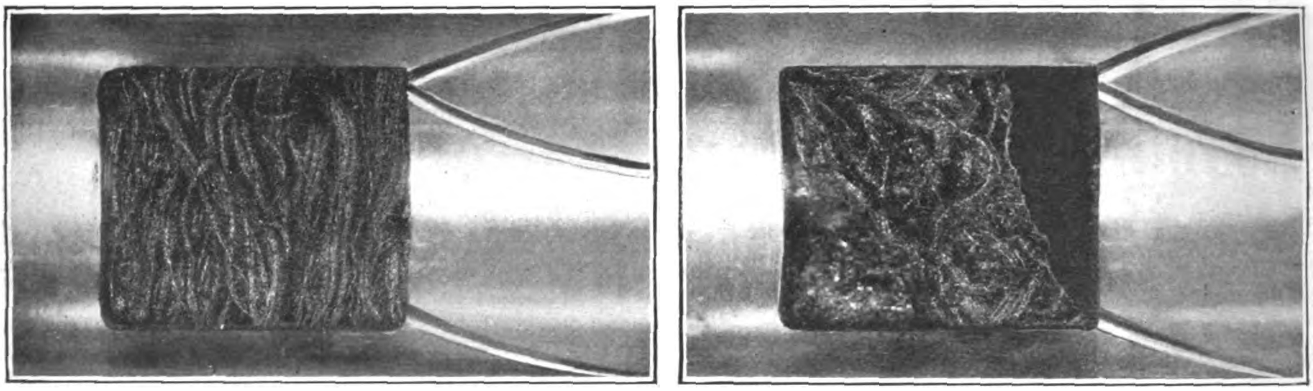


Fig. 3—With the Incorrect Grooving Shown It Is Not Possible to Drain the Chamfer Properly



At Left—Section Through Bearing Showing Appearance of the Long Wool Strands When Correctly Packed. At Right—In an Incorrectly and Loosely Packed Bearing the Waste Is Seen to Be in Balls Rather than in Wick-Like Strands. Note that the Waste Does Not Fill the Window Completely

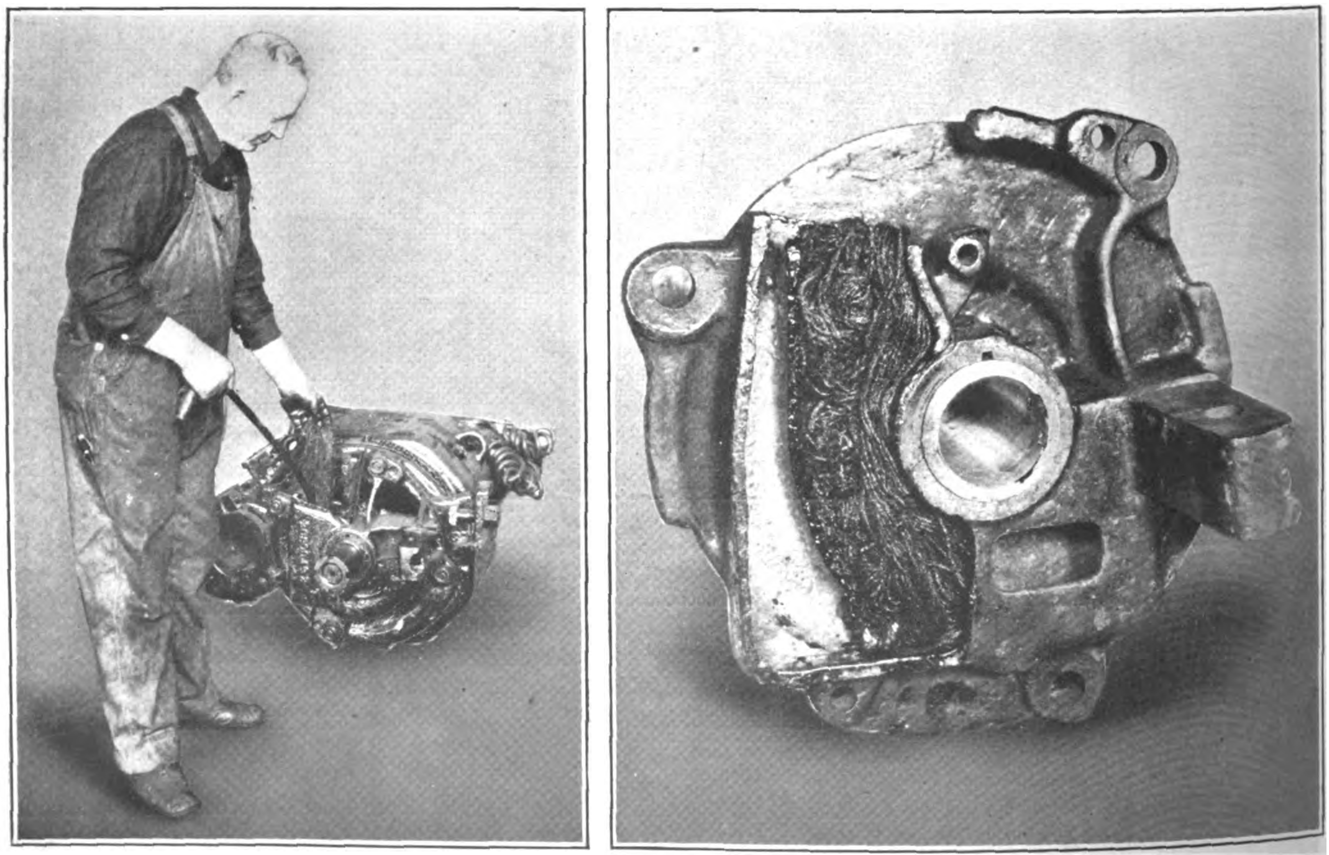
is shown by the comparative distances the oil is lifted after a considerable time, as shown in one of the accompanying illustrations.

Felt has been used successfully in some bearings, particularly where there is a positive, independent oil feed which keeps it well saturated. An example of such use is on electric locomotive jackshaft bearings. But in the usual type of bearing, where the packing both lifts the oil and applies it to the journal, felt is unsatisfactory, as it will glaze when the oil supply becomes lean. Cotton materials are unsuitable as a packing for bearings because they glaze so readily.

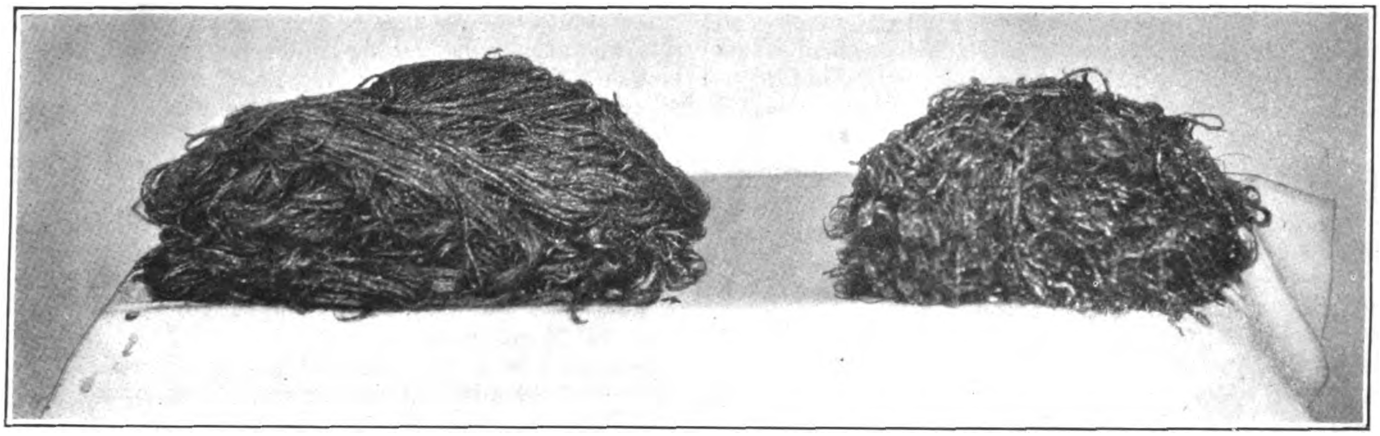
Wool waste is the only material that has been successfully used as a packing material. This is because of its mechanical characteristics. It does not glaze as readily as the other materials and it is not so inert, hence it is not so liable to be jolted away from the journal. Since wool waste is desirable on account of its mechanical characteristics, it is important that its relatively poor capillary properties be compensated for as far as possible by securing a long strand wool waste, free from adulteration.

The capillary characteristics of wool waste are shown by the curve in Fig. 1, where the quantity of oil lifted is plotted against the height of lift. This curve is for medium car oil operating at bearing temperatures (viscosity, Saybolt, 54 at 100 deg. C.). The important points illustrated by it are:

1. The maximum possible lift is 5 in.
2. Maximum lift for the minimum safe oil supply is about 3 in.
3. The minimum lift for reasonable economy in oiling is about ¾ in.
4. For further decrease in lifts the oil feed increases quite rapidly. The feed at ½-in. lift is twenty times that at 3-in. lift.



At Left—Packing a Railway Motor Bearing Correctly, Showing How the Wick Should Be Put in Place. At Right—A Correctly Packed Pinion End Housing. The Outer Shell Has Been Cut Away to Show the Wick in Place



Amounts of Waste Taken from Bearing Housings—at Left, from a Correctly Packed Housing; at Right, from an Incorrectly Packed Housing

5. The correct lift for this grade of oil is from 1 to 2 in. For the pinion end bearing of a 40-hp. motor in average service this will give an oil consumption of approximately 1 gill per 1,000 miles.

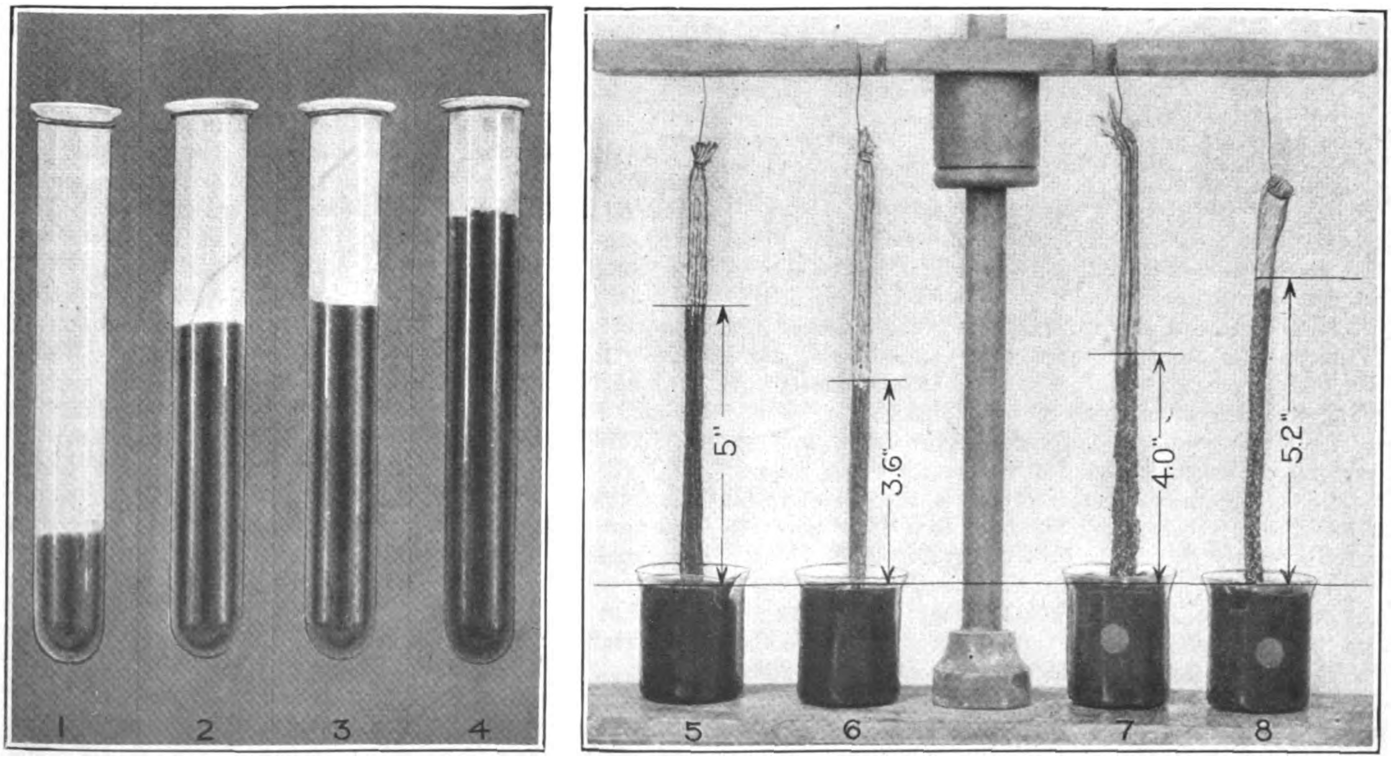
The curve shown represents conditions for a medium oil. Other tests show that viscosity is an important factor in oil feed. A heavy car oil gave a feed of only about one-half that of the medium oil. This indicates the importance of changing promptly from summer to winter oil at the right time, as otherwise a feed that is too lean will result in cold weather. Even then the oil may become very heavy in cold climates. In such cases a shorter lift should be used, ranging from about ½ in. to about 1½ in. It may even be advisable to use shorter oiling periods during the winter months to maintain these levels. These practices must be worked out for each case.

The quantity of waste used was found to be just as important as the quality, for the oil feed was very nearly proportional to the amount of waste in the wick. The amount of oil fed to the bearing also was found substantially proportional to the amount of waste in contact with the journal, showing that anything short of a full window is cutting down on the necessary oil supply, a point often overlooked.

These capillarity tests showed that another fundamental characteristic of waste-packed bearings is the time required to lift oil a given distance. This varies slightly with different materials. To obtain the maximum possible lift of 5 in. previously given for wool waste required sixty-six hours for the particular oil used. This explains why the oil feed is so low at the long lifts, and why it is important to prevent the oil level from running too low.

METHOD OF PACKING THE BEARING IS IMPORTANT

The importance of properly packing the bearing is not generally appreciated, and bearings often are put in service with imperfect packing. A number of points should be watched in packing a bearing correctly. A good grade of long strand wool waste should be used, and it should not be pushed into the housing in balls,



The Test Tubes Contain Amounts of Medium Grade Oil that Various Materials Will Lift Under the Same Conditions. At Right—The Actual Heights to Which a Medium Car Oil Rose After 66 Hours Immersion of the Lower End of the Wick

1 and 5, Wool strands. 2 and 6, Black felt. 3 and 7, Cotton wick yarn. 4 and 8, Lamp wick.

but a continuous wick should be formed from the oil chamber to the journal. The window in the bearing should be filled completely with waste, which should be packed down firmly, and a separate wad of waste should be placed on top of the main body of the packing to keep out dirt. A number of these points are shown in the illustrations.

The first step in packing the bearing is to prepare a wick from a bunch of oiled waste, as illustrated. This wick should be long enough to reach from the bottom of the oil chamber up to and across the bearing window. After this has been placed in the housing the waste chamber should be filled up by tamping waste in behind the wick, using care to force the wick firmly against the window. In some housings, especially on the larger motors, and on the pinion ends of most motors, the window extends a short distance inside the plane of the housing wall. In packing such housings the waste should be tamped inward so as to fill the window completely.

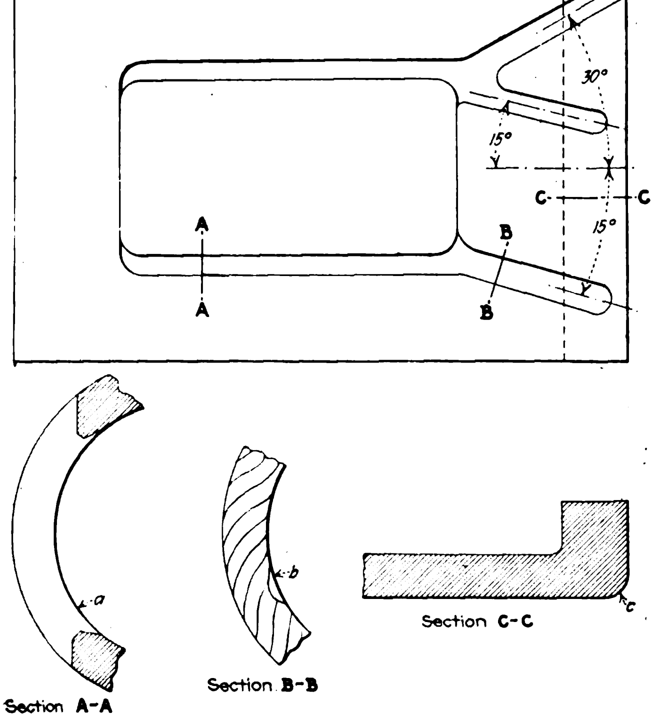


Fig. 4—This Design of the Grooves Has the Advantage that They Can Be Easily Cut to Drain the Chamfer

The function of the wick is to provide a direct path from the oil chamber to the window, and also to prevent areas of imperfect packing in the window such as are often obtained where balls of waste join.

The bearing inspector should be furnished with the limiting oil levels for each of his motors, and then oil should be supplied at such intervals as will maintain these limits. It is common belief that it is perfectly safe to run the motor until the oil level nears the bottom of the oil well. This is not the case, as reference to the curve of oil feed will show. True, the bearing may run without overheating, but unnecessary wear certainly will result. The difference between the minimum level specified and the bottom of the well is provided as a factor of safety—something to fall back on in case a motor is overlooked at the regular oiling period.

The oiler should gage the oil and then pour in enough to bring the level to the upper limit. A little experience will tell him how much to put in to do this, and usually one gaging is sufficient. The oil should be poured in through the filling hole, as when pouring oil on top of the waste any dirt present will be washed right into the bearing. Should the oil level in the housing become very low, however, the standard practice should be departed from and some oil poured into the waste chamber. This is best done by removing a part of the waste so as to get the oil as near the window as possible. If the regular procedure were followed a hot bearing might develop before the waste had time to raise the new supply of oil to the window.

When a motor has been dismantled for bearing replacements or overhaul, the bearing should be repacked with waste thoroughly saturated with oil and the journal smeared with oil before it is assembled again. This simple precaution will often prevent hot bearings, as the capillary action of the waste is often too slow to get sufficient oil to an initially dry journal to keep it from getting hot, especially if the motors go into hard service immediately.

CAREFUL DESIGN OF OIL GROOVES IS ESSENTIAL

There is no such thing as a flow of oil in waste-packed bearings, as that term is understood for oil ring bearings. Only a very small amount of oil is wiped into the journal by the waste. When the journal first begins to turn, oil is carried only to that portion of the bearings which is spanned by the window, unless the journal has been previously smeared with oil. The oil then works very slowly out from the window. Starting with a dry bearing of a 40-hp. motor, it may take as long as fifteen minutes for the oil to travel from the window to the ends of the bearing.

A great problem is to keep the shell tight in the housing, and a sufficient length of the shell must be left to give the desired press fit. Therefore, oil grooves are used to aid in carrying oil from the window toward the ends of the bearing. Since the oil flow is rather meager it is important to obtain the correct location of the grooves to get the maximum aid in distributing the oil. If the grooves are not properly made and located they will prove a detriment rather than a help.

A good system of grooves is shown in Fig. 2. Notice that the top and bottom edges of the window are chamfered, as in Fig. 4, forming a trough in which the oil accumulates and feeds the oil grooves. The grooves should be cut from the chamfer so as to drain it completely. Otherwise imperfect lubrication will result. The grooves shown in Fig. 3 will not function properly because they do not lead from the chamfer. Tests have been made which show that grooves which are correctly cut as shown in Figs. 2 and 4 will deliver about four times as much oil to the bearing as can be delivered by the imperfectly cut grooves shown in Fig. 3. In cutting the grooves care should be taken to round off the corners as shown at *b*, Fig. 4. If sharp corners are left they will scrape the oil from the journal. As a rule, the window is close enough to the outer end of the bearing to render grooves unnecessary at that end.

A large radius at the collar end of the bearing is very essential to the lubrication of this end of the bearing because most hot bearings start at this end. If the corner is sharp there is no place for the oil to go when the wiper is pressing against the bearing flange; in fact, the oil must flow against a slight pressure. With a large radius, a place is provided for the oil to drain into without resistance and a more positive feed to the bearing flange is provided.

Bearings should be started in service with the minimum clearance that will permit the oil to flow freely between the journal and the bearing. Very little work has been done toward the determination of the thickness of oil films for waste-packed bearings, but experience has shown that satisfactory clearances between the journal and bearing, measured after the bearing is pressed into the housing, are 0.006 in. for journal diameters up to 3 in., 0.007 in. between 3 and 4 in., 0.008 in. between 4 and 5 in. and 0.009 in. clearance for journals between 5 and 6 in.

The importance of close bearing clearances, especially in maintaining the gear centers, cannot be overestimated. The main items of motor maintenance are due to mechanical failures or to electrical troubles induced by them. An analysis will show that vibration is the underlying cause of most of these failures, and that a main cause of this vibration is improperly meshed gears, due to worn bearings. This vibration increases at an accelerated rate as the bearings wear. If the bearing wear is reduced and close clearances maintained the upkeep of the bearings will be reduced, and the general motor maintenance will be lessened.

The maximum operating clearances depend upon the size of the motor. Take, for example, a 40-hp. motor with 3½ diametrical pitch gears. With a ⅛-in. wear of the axle bearing and a 1/16-in. wear of the armature bearing there will be a spread of the gear centers approximately 5/32 in., or about one-fifth of the gear mesh. Such clearances are quite common, and often they are greater, with correspondingly more severe vibration. Greater over-all economy can be obtained if the bearings on a 40-hp. motor, for example, are removed at clearances of 1/16 in. and 1/32 in. for the axle and armature bearings respectively. These clearances may be safely doubled for motors using 2½ and 2 pitch gears.

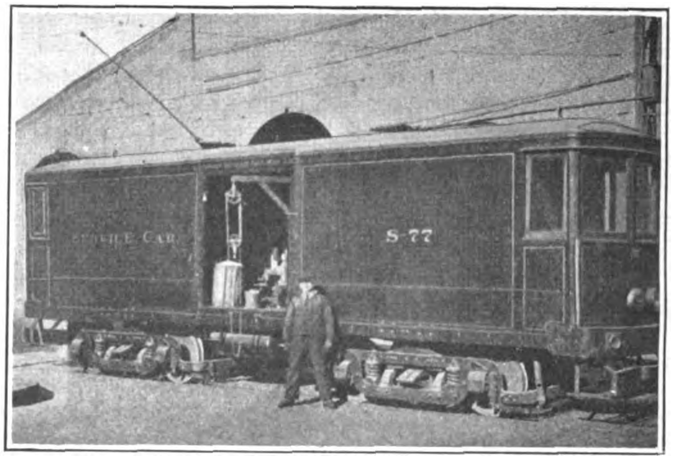
A large amount of bearing trouble could be eliminated and lower cost of bearing maintenance obtained if the job of packing and oiling the bearings were placed in the hands of skilled men, who could be held responsible for the condition of the bearings.

Well-Equipped Wrecker Proves Its Worth

AN EFFICIENT type of wrecking car is in use on the Union Street Railway, New Bedford, Mass. This car was specially built for the purpose and is equipped with the heaviest trucks and most powerful motors that the railway had available. Complete wrecking equipment, including a convenient work bench, is inside the car. A red band is painted on each tool to discourage removal from the emergency car for use elsewhere in the shops.

The car is equipped with a special derrick on the side, as shown in the accompanying illustration. This is used principally for swinging out pony trucks and placing them on the adjacent track. On the bumpers are several cast-iron sockets which serve as receptacles for the ends of push poles.

The crew comprises four men, including the master mechanic. A special bell call. No. 13 on the auto-call system in use in the shop, is used for emergency. Upon hearing this signal these men instantly leave all other work and proceed to get out the wreck car. There is an overall locker in the car so that men who respond to an unexpected call can don their overalls on the way to the job. Although the need is infrequent, the railway considers it an economy to maintain a thoroughly equipped wreck car.



Pony Trucks for Use in Case of Accidents Are Swung Off the Wreck Car by Means of a Derrick

Maintaining Automatic Sprinklers

Record of 95.7 per Cent of Fires Controlled in Sprinklered Buildings Can Be Increased to 99 per Cent with Proper Inspection and Maintenance

THE wide use of automatic sprinklers in all types of buildings has led the insurance committee of the Chamber of Commerce of the United States to include a leading article on the subject in its publication, *Fire Prevention Bulletin*. The following abstract gives information of value to electric railway men in the maintenance of sprinkler systems:

After a fire has been extinguished by sprinklers the control valve of the operating sprinkler system is closed and the water drained from the system. The sprinklers which functioned are then replaced and the valve reopened. A man should be kept at the closed valve until restoration of the protection, holding himself ready to turn on the water should fire again start.

It is advisable to force all air out of the piping when refilling it with water. This can be done by opening a small test valve which is usually found at the top of the sprinkler system. The valve should be closed when all of the air is exhausted and water begins to flow through it.

When continuous heating of buildings at all times, including idle periods, is not feasible, a dry-pipe automatic sprinkler system is often installed. In this type air replaces water in the pipes. It is under sufficient pressure to keep closed a device known as a dry-pipe valve. In the event of fire the air escapes through sprinklers which are opened by the action of heat upon their soldered links. When the air pressure is decreased sufficiently the dry-pipe valve opens and allows water to flow through the pipes.

Following a fire which has been controlled by a dry-pipe sprinkler system, the water valve is shut, the entire system drained and the fused sprinklers replaced. It is then necessary to reset the dry-pipe valve. This work should be done by a mechanic who is acquainted with the construction and operation of the valve. The system is next refilled with air to the original pressure and the control valve opened so that the sprinklers may be ready to function at any time.

The National Fire Protection Association has compiled a record of fires in buildings protected by automatic sprinkler systems. The list comprehends a period of twenty-six years and a total of 28,814 fires in sprinkled properties, as tabulated below:

RECORD OF AUTOMATIC SPRINKLERS

	Number	Per Cent
Extinguished fires	19,007	66.0
Checked fires	8,583	29.7
Satisfactory control	27,590	95.7
Unsatisfactory control	1,224	4.3
	28,814	100.0

A large portion of unsatisfactory controls is due to improper maintenance. The reasons for and extent of this unsatisfacory experience are summarized by the National Fire Protection Association as follows:

CAUSES OF UNSATISFACTORY CONTROL

		Per Cent
*1.	Water shut off from sprinkler systems	29.3
*2.	Generally defective equipment and unsprinkled portions	20.0
*3.	Defective water supply	9.3
*4.	Freezing of water in sprinkler systems	3.3
5.	Slow operation of dry-pipe valves or defective valves	2.7
6.	Slow or defective operation of high temperature automatic sprinklers	1.8
*7.	Faulty building construction, sealed spaces, unenclosed floor openings, etc	5.1
*8.	Obstruction to distribution of water from automatic sprinklers	5.7
9.	Hazards of occupancy too severe for ordinary sprinkler system	5.7
10.	Explosions crippling sprinkler systems	4.5
11.	Exposure fires or conflagrations	5.8
*12.	Miscellaneous	6.8

The items preceded by an asterisk (*) indicate the faults which may be corrected by property owners. Based upon the experience of this twenty-six-year period, these conditions are responsible for fully 75 per cent of unsatisfactory fire control by automatic sprinklers and, if remedied, the efficiency of performance of sprinkler systems should rise to 99 per cent.

Water shut off from sprinkler systems is by far the chief reason for unsatisfactory results. It is due mainly to indifferent maintenance, as indicated in a classification of 360 fires which were not controlled because water was shut off from the sprinkler systems. The causes for shutting off the sprinklers in 134 of these cases were unknown or were due to neglect or carelessness. In seventy-three cases the sprinklers were shut off to prevent freezing.

Whenever a sprinkler control valve is closed, shutting off water from all or part of a sprinkler system, some one should be stationed at the valve ready to open it in case of fire. In the event repairs are being made, it is not always necessary to keep water from the entire system while the work is being done. Temporary connections can sometimes be made which will supply water to at least a portion of the section which is undergoing repairs.

Some sprinkler valves are closed in the winter months to prevent freezing. In general dry-pipe valves should be used in such places. If any valves are closed for the winter months, they should be tagged and a record kept by the man supervising the system in order that they will not be forgotten in the spring.

Water control valves are often sealed. The seals should not be broken and valves closed without permission from some one in authority upon whom will rest the responsibility of seeing to it that the valves are opened again as soon as possible. On many properties inspections of all valves are made daily to insure that they remain open and in proper operating condition.

There are mechanical methods available for facilitating a constant check of sprinkler control valves. Some of them give an alarm whenever a valve is closed. One of these methods is the so-called central-station supervisory service which keeps the entire sprinkler system under constant supervision. Another system provides watchmen's stations at each sprinkler valve. These stations cannot be recorded if the valve is closed.

Such conditions as badly corroded or painted sprinkler heads should not be permitted. Inspection departments are usually glad to test suspicious sprinklers.

Among the sources of water supply are connections to public water systems, gravity tanks, pressure tanks and private pumps. The condition of the source or sources of water should be under constant observation in order that there may be no impairment of the supply. In general, tanks should be filled weekly. Pumps should be turned over periodically to determine their operating condition.

Buildings equipped with sprinkler systems containing water at all times should be heated throughout in freezing weather. Water in the ends of pipes near windows, especially if the latter are left open, is likely to freeze. This will burst fittings or the automatic sprinklers themselves, thereby crippling the system. In cases where dry-pipe sprinkler systems are used, care should be taken that they are absolutely free of water. Because of improper draining or condensation, small quantities of water sometimes remain in the pipes. A small drain can be opened which will permit the air pressure to expel the water. It is suggested that this be done by employees acquainted with dry pipe systems.

Alterations such as the installation of partitions, wide shelving, storage racks and platforms, benches, etc., may form serious obstructions to the proper distribution of water from sprinklers. This condition may be remedied by introducing frequent openings in the obstructing surfaces or by installing sprinklers below them. Alterations should be so made that water from the sprinklers can cover the entire area without hindrance.

Improper piling of stock is often a cause of insufficient water distribution. The full effective action of sprinklers requires about 24 in. of clear space below the sprinkler heads so they may form an unbroken spray of water from sprinkler to sprinkler and to the side walls and partitions.

This cause of unsatisfactory control is increasing in extent. An automatic sprinkler system is intended primarily to control fire at its place of origin, but this is not assured when individual sprinkler heads cannot completely distribute water over the entire area allotted to them.

SELF-INSPECTION SYSTEMS

Owners of property equipped with automatic sprinklers will find it advisable to establish some form of self-inspection for all fire protection equipment, including automatic sprinkler systems and apparatus used for manual control of fire such as hose equipment, hydrants, extinguishers, etc. Whatever may be necessary properly to establish such a system can be ascertained from such sources as the engineering departments of fire underwriters, inspection departments, independent inspection bureaus and insurance agents. Some automatic sprinkler companies have service departments which assist in maintaining sprinkler equipments.

Correct Welding Procedure Retains Qualities of Manganese Steel

By Use of Arc Welding in the Field, Life of Manganese Steel Special Work Can Be Increased One to Five Years — Type of Welding Rod, Technique Employed and Speed of Cooling All Affect Physical Characteristics of Welded Material

By Howard H. George
Engineer Maintenance of Way Public Service Railway, Newark, N. J.

IT IS generally acknowledged that a good weld of any steel depends largely upon the skill and experience of the operator. This is particularly true of manganese steel, but the common difficulties are greater than with ordinary steel and there is the added trouble due to the effect of the heat in producing brittleness in the manganese casting. It has been found, however, that careful selection of the welding rod, manipulation of the arc and regulation of the speed of cooling of the weld will make repairs that have sufficient life to justify the use of the process in the maintenance of manganese steel special work.

The use of the electric arc for track welding goes back twelve or thirteen years. During this time its growth has been phenomenal. At first used only for welding splice plates or bars to the rails, its application soon spread to building up the heads of rails where cupped at the joints and then to the repair of manganese steel inserts in special trackwork, and also for welding breaks in solid manganese steel pieces. As usual with a new process, but little attention was given to the theory, and what was actually taking place under the arc was scarcely understood. The natural result was that many failures occurred in the early work, and many disappointing results were obtained.

As the process developed, more and more attention was given to analysis of questions such as the determination of what was actually occurring under the arc, the effect of the heat generated on the physical characteristics of the steel being repaired, the chemical and physical requirements of the welding rod and the comparative results obtained by different welding methods. The accurate determination of these and many other questions was found essential in order to improve the technique of arc welding. A comprehensive investigation of the arc welding process for rail joints is now under way by the welded rail joint committee organized under the direction of the American Bureau of Welding, and it is expected that this work will develop valuable data. The manufacturers of arc welding apparatus and also those manufacturing welding rods are now conducting independent investigations to determine what has been wrong with past practice and what should be done to correct these errors.

The industry must be prepared to make some radical changes in the near future in the method of application of the arc weld process now in general use, particularly with respect to joint work. This should not discourage the use of the process, which is merely going through the same form of development that has been experienced with practically everything connected with the operation and maintenance of the street railway. The changes resulting from the combined efforts of the various investigators naturally will be for better and not for worse.

ATTENTION TO DETAILS OF PROCESS IMPORTANT

Formerly, it was thought that all that was required in the welding process was to heat up the rail head or steel surface to be restored and fuse in with it some additional metal. It is now becoming generally recognized that successful welding requires a definite technique, including a certain polarity and a fairly definite manipulation of the arc. The temperature is also found to be an important factor. For a certain composition of rail steel or manganese steel casting, it is now understood that a reasonably definite chemical analysis of welding rod and, in the case of joints, of splice bars is essential. Also, in practice it is found that an electrode with positive polarity gives better welding characteristics and that the loss of carbon and manganese in the deposited metal is less. When welding with manganese steel either on manganese or on high carbon steel, it is advisable to form a rather wide deposit by a slight oscillation of the electrode so as to give a deposit approximately double the width of that obtained by drawing the electrode along a straight line. By this manipulation of the arc, the deposited metal is kept in a molten state for a somewhat longer period, allowing time for the escape of any gas which may be included in the deposit, and thus preventing the formation of blow holes. The manipulation produces a puddling effect and makes more certain the complete alloying in the deposited metal of the ingredients in the rod and its coating.

WELDING CAN BE USED FOR MORE THAN TEMPORARY REPAIRS

Welding in the street with the manganese process has, up to the present stage of its development, generally been considered as a very temporary or emergency repair proposition. With the improved alloy steel rods now being developed, however, in many cases the results being obtained are considerably better than what might generally be considered as temporary repairs. This class of work is of double importance from an economical standpoint because of the great cost of special trackwork as compared with straight rail, and because of the delay sometimes experienced in securing delivery of replacement pieces. It is of course not practical to carry in stock sufficient renewal pieces to cover every emergency that may arise, by reason of the special character of the various special trackwork designs. Ordinarily, when a switch tongue breaks, it is possible to renew the tongue from stock because of the limited number of types of tongues which are usually found on any given property and which need to be carried in stock. But with a combination frog or solid manganese mate. for instance, this becomes an entirely different matter.

It obviously is impossible to determine definitely what added life can be secured from a special piece such as a frog or mate, where the manganese insert has been built up by arc welding. This depends on such factors as the skill of the workman, method and materials employed, the extent of deterioration of the piece at the time repairs are attempted, general track conditions, and care taken in subsequent grinding of the surface after welding. Many otherwise satisfactory welds on manganese inserts have failed prematurely either because of neglect to grind promptly or failure to see that this part of the work was properly done, thus imposing stresses in the welded metal considerably beyond its ability to withstand, and hastening its failure. While in some cases repairs with every appearance of a satisfactory weld have failed within a very short period, it is not believed that this is the general experience with welded repair work.

Considering the cost of replacing the special piece as compared with the cost of temporary repairs with the arc weld process, it is generally felt that if an additional year of life can be obtained the expense of making repairs is fully justified. This increase in life is not unusual by any means. As a matter of fact, even though the work was done during the experimental period when the present improved welding rods were not known, and when the operator was not as well informed as to the requirements for a successful weld as he is at present, this additional year of life has frequently been exceeded, and two years of additional life often has been obtained. This latter figure probably should be more correctly considered as representing the average increase to be expected. Numbers of cases have been reported where the increase in useful life due to welding has gone as high as five years, and with our increased knowledge of the process and improvements in welding apparatus and materials, it is even reasonable to believe that this will be a usual expectancy.

In some cases arc welding repairs would be entirely justified even though they lasted but a few weeks, for this would give the engineers sufficient time to secure a new piece from the special trackwork manufacturer and would enable them to keep traffic moving during the interval without excessive damage to the remainder of the track or to the equipment.

REPAIRS SHOULD BE MADE PROMPTLY

It is desirable that repairs be made when the failure of the manganese is in its early stages and before the balance of the structure has been affected by the excessive pounding of the car wheels over the broken insert or casting. It is quite probable, for example, that in the case of filling blow holes or sand holes which are occasionally encountered in casting, sometimes discovered before the piece has been put in service and sometimes developing shortly afterward, the work is more or less in the nature of patchwork but generally there is sufficient actual fusion of the two metals to justify calling the operation a weld.

The nature of the problem will be better understood when it is explained that when the manganese content is increased above 2 or 3 per cent the strength and durability normally decrease while the hardness increases. Manganese frogs and crossings contain between 11 and 13 per cent manganese. Opinion varies as to the chemical analysis of the deposited metal as compared with that of the welding rod. The manganese content of the welding rods now commonly used probably will vary from about 10 to 15 per cent.

Tests made by one company indicate that, using bare electrodes, the loss in manganese will vary from 1½ to 2½ per cent. These tests indicated that while a coating stabilizes the arc, with most of the coated rods available on the market the manganese loss was at least equal to that secured when using bare electrodes, due to absorption of the manganese by the fluxing material. The conclusion reached as the result of these tests was that since experience dictates that the manganese content of the wearing surface preferably should exceed 10 per cent, it is desirable to employ electrodes in which the manganese does not fall below 12 per cent. It has been found possible to secure in the deposited metal manganese content equal to or greater than that in the electrode by coating the rod with powdered manganese. The use of such a coating obviously permits the utilization of manganese steels having a wider range in manganese content.

EFFECT OF PHYSICAL TREATMENT ON STRENGTH OF METAL

It is considered essential that the heat of the arc be kept at the minimum required to bring the metal to the point of fusion and that the overheating of the steel be minimized as far as possible. The following abstract from a report made several years ago by the metallurgist of one of the large manufacturers of manganese steel trackwork castings will emphasize the necessity for this:

> In its cast condition, manganese steel is extremely brittle, so much so that, when broken, a test bar of untreated manganese steel will give almost no angle of bend. In order to confer upon the metal the toughness which is so important a property in all its applications, the casting after it is taken from the mold is heated in an annealing-furnace to a temperature of approximately 1,050 deg. C. or 1,920 deg. F. After being heated to this temperature, the steel must be quenched in cold water, and it is important that it be put in the water as soon as possible without allowing it to cool off slowly. If it cools, even in the air, below a certain definite temperature, before being put in the water, the casting possesses very little toughness and is quite unfit for service.
>
> If the toughened steel is again heated to a temperature over 300 deg. C., it becomes extremely brittle, quite as much so as in the cast condition, and it will be brittle after heating to these low temperatures whether it is cooled fast or whether it is cooled slowly. If heated after toughening to temperatures between 300 deg. C. and 700 deg. C., the same is true, the steel being brittle even if cooled rapidly. If heated after toughening to temperatures between 700 deg. C. and 1,050 deg. C. the steel will be brittle if cooled slowly, and will be more or less tough if cooled rapidly, the toughness increasing as the temperature is raised from 700 deg. C. to 1,050 deg. C.

It is obvious, of course, that it is not practical to remove the piece and heat-treat it to give it the desired characteristic toughness. It is realized that the heat treatment of shop practice cannot be duplicated in the field, and that the next best thing is therefore to be desired. While in many cases the rapid cooling received by the arc-deposited metal in normal deposition is sufficient to give certain wearing qualities, it is nevertheless considered desirable, in the opinion of some engineers, whenever practicable to quench each layer deposited at frequent and relatively short intervals. The normal water toughening treatment amounts to raising the temperature of the metal until the desired molecular structure is produced, and then fixing it at that point by increasing the normal cooling rate. Likewise, in the case of welding manganese the metal heated to a high temperature by the welding operation is suddenly cooled from a temperature as nearly as possible equal to that for the desired structure. Naturally this localized control of the heat is not the same as where the entire casting is brought up to the required temperature and suddenly quenched in cold water. It undoubtedly results in zones of very brittle manganese steel which, sooner or later, are responsible for many of the failures which occur. It does, however, constitute the best known practice for field operations at the present time.

It is essential in trackwork where welding is to be continued to dry the surface where the arc is to be established, as otherwise difficulty will be experienced in establishing the arc. It is also considered essential that the surface to be built up should be thoroughly cleaned. The means used to accomplish this will vary with the condition of the piece, a wire brush being sufficient in some cases, whereas a portable grinder may be required in others. All grease or other foreign matter must be removed, however, no matter what means may be employed.

Portable Pneumatic Equipment Reduces Track Reconstruction Cost

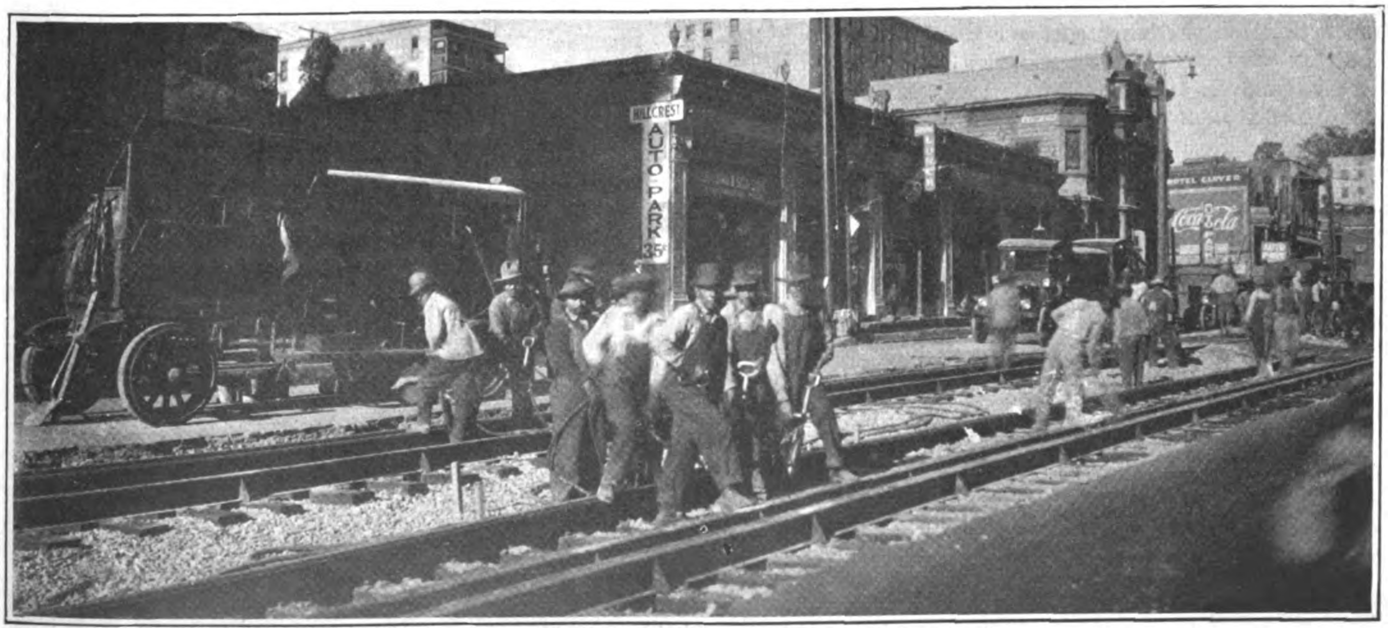
The Expense of Ballast Tamping and Pavement Cutting on the Pacific Electric Railway Has Been Cut in Half—Greater Rapidity Is Another Advantage—Better Work Is Done if the Men Are Allowed Intervals of Rest—The Apparatus Used in Los Angeles Is Described

By Clifford A. Elliott
Cost Engineer Pacific Electric Railway

FOR maintenance work on its tracks in paved streets the Pacific Electric Railway has used pneumatic tie tamping and pavement cutting tools for the last six years. The experience of this company indicates that the use of mechanical tools has reduced the expense of tamping and cutting by nearly half. Better results have been obtained and the life of the track has been prolonged. When working in congested streets the time saved has been an important item.

An illustration of rapid machine cutting work is furnished by a job done in January, 1924. This consisted of reconstruction of one of the company's double-track, combination-gage lines in the downtown congested district of Los Angeles, where a thirty-second car headway is operated. A total of 18,585 sq.ft. of 6-in. asphalt concrete pavement was excavated in twenty-one compressor days. It is estimated that under the handicaps connected with this job it would have required fifty working days to remove the pavement by old hand methods. Considering the traffic disturbances due to street cars and vehicles, this performance is considered very satisfactory.

When pavement was recently removed in order to lay a second track on Sixth and Front Streets (San Pedro), Los Angeles Harbor, 26,500 sq.ft. of paving was taken up in twenty-four working days. This involved 23,000 sq.ft. of 6-in. concrete base and 3-in. asphalt wearing surface, laid in 1916, and 3,500 sq.ft. of 9-in.



Three Air Compressors at Work Simultaneously in the Downtown District on Combination Gage Tracks, Where the Job Had to Be Done Without Interrupting a Thirty-second Headway

Pneumatic Paving Cutters Opening Up Pavement of 6-In. Concrete Overlaid with 3-In. Asphalt

Cutting Up a 9-In. Solid Concrete Pavement with the Pneumatic Cutters

solid concrete pavement laid in 1920. It required sixteen compressor days on the concrete base, asphalt-wearing surface type and eight days on the solid concrete type. In the case of the less solid type pavement 1,000 sq.ft. of pavement was removed in six hours. On the solid concrete job 600 sq.ft. was cut out in nine hours.

It is estimated that in general four pneumatic cutting tools can accomplish in approximately forty minutes what it formerly required four men approximately five hours to do. This naturally has an important bearing on the ultimate cost of track reconstruction. Average figures show that pavement can be removed on the Pacific Electric lines approximately 50 per cent cheaper by machine than by the old hand methods.

Based on wages paid the Mexican labor used in operating these pneumatic pavement cutting tools, the company finds that in handling emergency or small repair jobs, and using its light duty machine, the cost averages 10 to 12 cents per square foot of pavement removed and made ready for wasting. Similar work handled by old hand methods costs from 20 to 25 cents per square foot. In handling the large reconstruction track jobs, when the heavy duty machines are employed, the average cost of removing pavement is about 8½ cents per square foot. For tamping ballast in track during reconstruction the labor cost per tie is 40 per cent less than by old hand tamping methods.

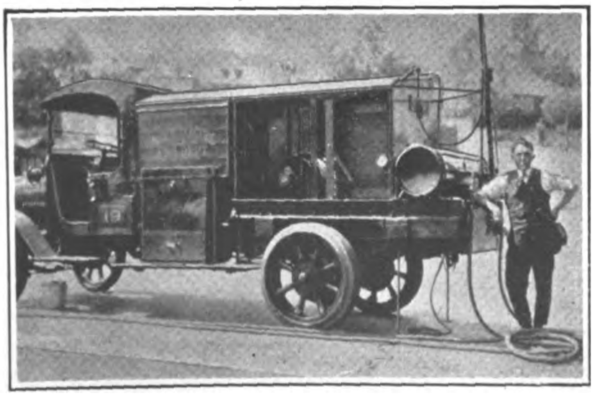
A gas-driven Ingersoll-Rand type 12x10 "ER-1" air compressor mounted on a trailer was used for the Sixth Street job. Cutting of the pavement was handled by two shifts, one nine-hour day shift and one nine-hour night shift. The average cost per square foot for the less durable type of pavement was 5 cents, while in the solid concrete type the cost averaged 16 cents per square foot. This was an unusual job because cutting is necessary only when new lines are constructed in city streets laid with solid concrete pavement. This type of pavement is not ordinarily used in and about the tracks by the Pacific Electric Railway.

The operation of the air compressor for a nine-hour working day or night shift on the above-mentioned job was arranged as follows:

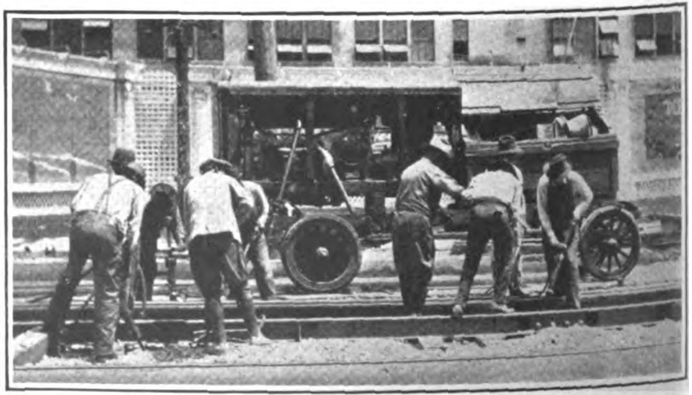
Four Mexican laborers operating cutting tools.
Two Mexican laborers as relief operators.
Two Mexican laborers as break-up or clean-up workers.
One mechanic operating air compressor.
One track foreman.
One flagman.

In organizing a paving cutting gang as outlined it has been found from experience that the laborers who operate the air guns are more efficient if they have, from time to time, a ten-minute or twenty-minute relief interval. For this reason the makeup of the paving cutting crew includes one laborer to act as relief for two air-tool operators. The relief man also handles the air hose, keeping it properly lined up or clear of traffic, for a given period of time before he takes his turn on the guns. This results in a revolving task for three laborers assigned to two air guns.

For light work the company uses an Ingersoll-Rand Imperial type four-tool, electrically driven air compressor. A direct-current 25-hp. motor operating at 500 volts furnishes the power. The air capacity is 120 cu.ft. per minute.



Supporting Rods at the Rear Steady the Truck When the Compressor Is in Operation



This Gas-Operated Compressor Used for Heavy Track Reconstruction Supplies Air for Eight Pneumatic Tools

This apparatus has been mounted on a 2½-ton motor truck. The layout on the truck, so far as the motor base and housing is concerned, is in accord with the Ingersoll-Rand standard mounting, but on the forward section of the truck the railway has provided tool cabinets for storing the pneumatic tools and the accessories of the machine.

Some features to improve the efficiency of the apparatus were added at the company's shop. Since the equipment is operated both day and night the truck has been wired and provided with electric lights. The current for the operation of the machine is taken from the trolley wire and a collapsible wooden pole has been designed and mounted on the rear of the truck. The pole is jointed and adjustable to any desired angle, corresponding to the distance of the machine from the track. When the pole is not in use it may be dropped to a position on the roof of the compressor. An adjustable clamp is used to connect the negative return wire to the rail. This clamp firmly secures the cable so that the vibration of passing cars will not interrupt the operation of the machine.

To reduce the vibration of the truck when the compressor is in service the rear of the body is supported from the pavement. Two 1-in. iron rods extend from the base of the chassis to steel plates 4 in. x 4 in. and 1 in. thick resting on the pavement. Round holes are drilled partly through the plates. The rods rest, therefore, in a sort of ball joint, which gives solid support to the frame. As it is always essential to have the compressor level these rods take the place of jacks. This is particularly useful when the machine is working on a narrow street where the pavement slopes sharply.

Steam Shovel Loading Broken Pavement When a Second Track Was Being Laid on Sixth Street

For large construction and reconstruction jobs in paved streets the company has also another specially constructed air compressor. It is electrically driven and takes current from the trolley. This machine has sufficient capacity for operating twelve pneumatic tools. That is, twelve tie tampers may be operated simultaneously, but only six pneumatic cutting tools may be operated at one time. If the cutting of pavement and tamping of ballast are being performed at the same time the machine will operate two cutters and four tampers. The apparatus is mounted on a trailer and hauled from place to place by motor truck.

Another machine used is a gasoline-engine-driven compressor of 60 hp., mentioned above. This requires 25 gal. of gasoline and 1 gal. of lubricant per working day of nine hours. The outfit is mounted on a trailer and its capacity is eight pneumatic air tools working continuously. No tests have yet been made to determine how many tools of different kinds can be operated simultaneously by this compressor.

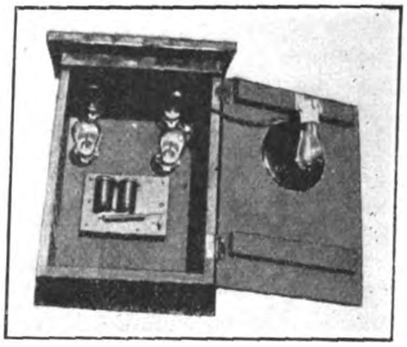
In calculating the cost of the work handled by these machines, depreciation, repairs, insurance and rental of the equipment are taken into consideration. It is estimated that the heavy duty, electrically operated compressor uses 14.92 kw.-hr. per hour. The cost of power per hour is also figured in the cost of the work where these types of machines are used.

Signal for Special Locations

By H. J. CHARTERS

Portland Railway, Light & Power Company, Portland, Ore.

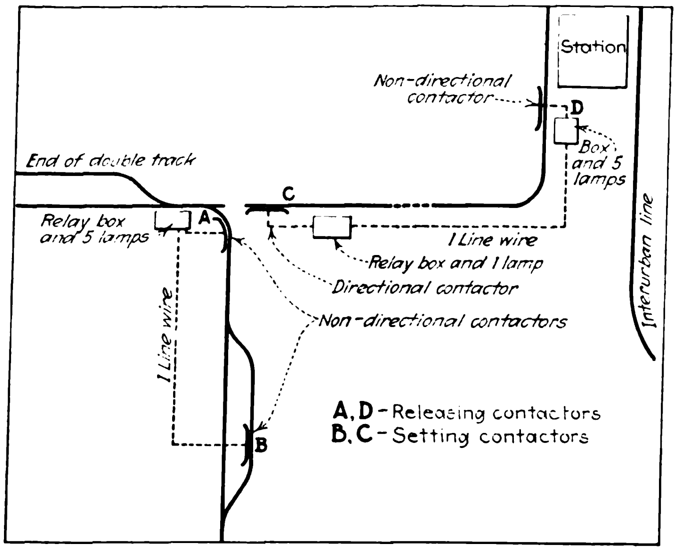
THIS company has developed a simple signal which is used for a number of purposes, such as the following: To indicate to the crew of an interurban train that a connecting city car is approaching; as a one-way block; as a terminal signal for use on the single track which extends beyond the end of a double track or beyond the last passing track on city lines. The device consists of a pick-up relay in series with five 36-watt Mazda lamps, of which one is mounted directly behind a 6⅜-in. ruby lens. This gives an indication which is visible even when on a bright day the sun is shining directly against the front of the box.



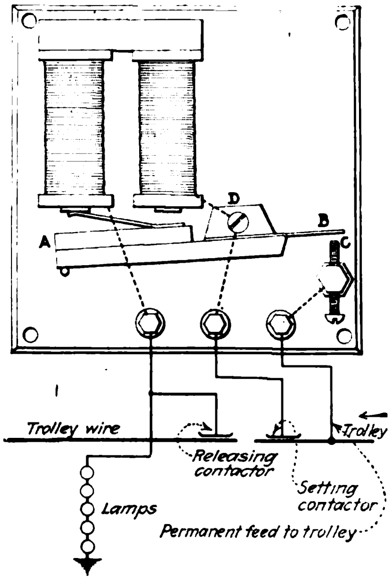
Signal and Relay Box Open for Inspection

The general principle of the relay is given in the smaller diagram showing the circuits. When a car passes under a setting contactor, a momentary current is sent through the relay winding, bringing the holding circuit into operation by closing the contact between *B* and *C*. Current continues to flow until a car passing under a releasing contactor shunts out of circuit the relay winding, which has 50 ohms resistance, releasing the armature and opening the holding circuit. A spring between the armature and the magnet core assists the former in dropping promptly.

Applications of this signal are given in the larger diagram. In this diagram the normal limits of a one-



Track and Signal Layout Showing Two Special Applications of Portland Railway's Signal way block are indicated by the setting contactor *B* and the releasing contactor *A*. Contactor *B* is placed to provide an overlap, as indicated. A car setting the signal from *B* will travel the length of the siding before passing onto the single track. Thus, if two cars enter the block from opposite directions at the same time, the one entering from *A* will have time to come into sight of the other car around the curve before the latter car has left the siding. The car on the siding can then wait until the other one passes, avoiding possible delay by one car having to back into the clear. Another application of the signal, shown in the same diagram, is to notify interurban crews that a city car is within a distance that will justify waiting for possible passengers. A relay and signal box containing one lamp is located at *C*, this lamp being connected in series with five in the signal box at *D*, the distance between the two signals being about ½ mile. A directional contactor at *C* causes the relay to close, lighting both signals. When the car passes *D*, a releasing contactor contact is made, opening the circuit. In this case the last connecting city car at night carries signs stating that it is such, and interurban crews have instructions to call the dispatcher in case the connecting car has not appeared up to their leaving time. In connection with this signal, nondirectional brush type contactors are used in most cases, but when necessary, United States Signal Company No. 5 switches are used to give directional selection. These simple lamp circuit signals cause little trouble. Their purpose is to prevent delays incidental to cars having to back into the clear. Under these conditions the burning out of lamps does not involve dangerous operation, the speeds of the cars not being high.



Circuits of Pick-Up Relay Used in Portland, Ore.

Pins Indicate Accident Locations

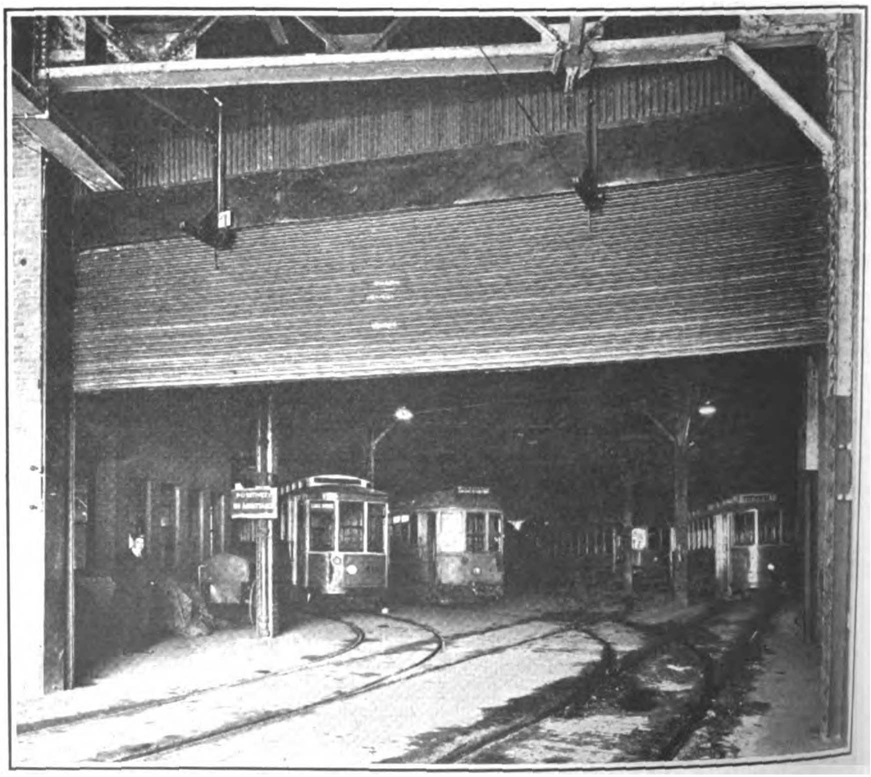
LOCATIONS of accidents on the Worcester Consolidated Street Railway are plotted for the general manager by means of colored pins stuck at the proper points on a large map showing the track layout of the entire system. Five different colored pins denote different kinds of accidents, such as automobile collisions, boarding and alighting accidents, car collisions, etc. When an accumulation of pins occurs at some point the attention of the management is drawn to the number of accidents occurring there and investigations are made with a view to remedying the situation.

Rolling Door Worked by Electricity

A ROLLING door recently installed at the entrance to the Main Street carhouse of the Worcester Consolidated Railway, Worcester, Mass., has proved very satisfactory. The track layout of this carhouse is such that all cars enter and leave through a comparatively narrow doorway, and it is therefore possible to close it off entirely by this rolling door. The door, which was made by the Kinnear Manufacturing Company, is electrically operated. It will open or shut in fifteen seconds. Push-buttons located in the dispatcher's office alongside the doorway control the operation. The control will either open the door, shut it or stop it instantly in any position. This is important to avoid accidents.

In order to prevent cars running into the closed door, bright red electric lights have been placed on both sides of it. These go on automatically when the door is closed and warn motormen to stop. When the door begins to descend, a hinged section of the overhead contact wire drops down to allow a space for the do. When the door is rolled up to open the passageway f the cars, this hinged section snaps back in place throug the action of a trip on the door.

This building is used not only as an operating carhouse but also as a repair shop. It is said that man tons of coal have been saved in the carhouse since the installation of this door last fall. The shop men working around the cars have now discarded the sheepskin coats formerly worn and the quality of the work performed has improved.



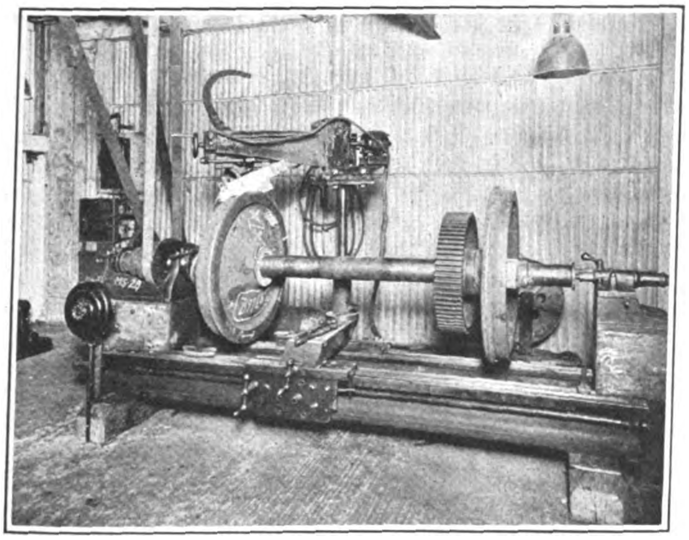
Through the Installation of This Rolling Door at the Carhouse Entrance a Considerable Saving of Coal Has Been Effected

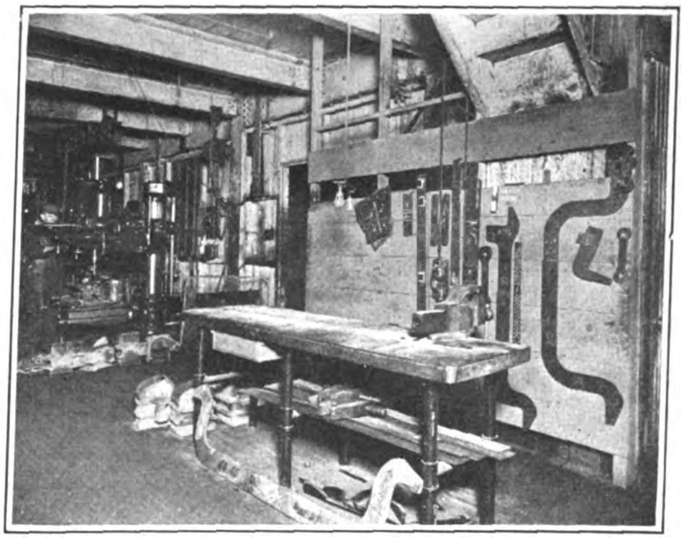
Comprehensive Shop Welding Program Makes Big Savings

Reclamation of Trucks, Motor Cases and Worn Steel Wheels and Axles in Shops of Springfield Street Railway and Worcester Consolidated Railway Has Materially Reduced the Waste Coincident with the Scrap Pile

BY THE installation of complete modern electric welding equipment the Springfield Street Railway and the Worcester Consolidated Railway, which are under the same management, have reduced to a small amount the quantity of material being sent to the scrap pile and have effected large financial savings. The efficiency of this reclamation program is increased by the use of American high-speed drill presses and a Lucas horizontal boring machine. The welding facilities at the Worcester shops are more elaborate than those at Springfield and much of the work is therefore done at the former place.

Rehabilitation of old trucks is accomplished in an interesting manner. The truck is entirely knocked down, wheels and axles are removed and reclaimed according to a process that is described in another paragraph of this article, motors are removed, and the armatures and fields taken out and sent to the armature room. Worn motor cases are built up by welding. The procedure in the case of an individual broken part that has to be taken out of service is similar to that employed when the entire truck is overhauled.


Flanges Are Built Up on Worn Steel Wheels at Worcester by Means of an Automatic Welder Placed on the Carriage of an Old Lathe


. Templates Are Used in Marking Holes to Be Drilled in Welded . Truck Parts and the Work Is Done on a High-Speed Drill

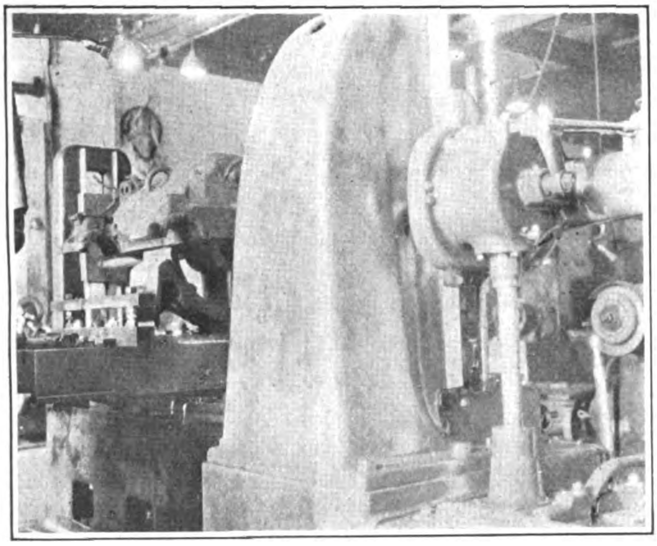
The method of reclaiming the equalizer bars of the truck is typical. These are first sent to the welding room, where all the bolt holes are completely filled in and worn parts built up by the electric welder. This process requires about two hours. They are then sent to the grinding table, where a man with a portable electric grinder smoothes them down. Fifteen minutes is required for that part of the job.

Next these pieces are taken to the marking table. Here there are steel templates for every important part of the truck frame. The templates are made with ½-in. holes in the exact position of the holes required in the truck member. Around each hole in the template is a 2-in. square of ¼-in. steel. The template is laid on the welded piece and a hand punch inserted in one of the holes. With a tap of a hammer the layout man then punches the precise center of the hole to be drilled in the piece. After the location of all holes to be drilled has been thus punched, the template is removed and the size of the hole is marked in chalk. The arrangement of templates hanging on a wall beside the layout table is shown in an accompanying illustration.

After being welded, ground down and punched the pieces are taken to the drill press. For drilling, an American high-speed drill is used. With this machine all the necessary holes in the equalizer bar of a truck frame can be drilled in ten minutes. One man operating this high-speed drill is able to do more work in less time than was formerly done by two men operating old-fashioned drill presses.

Having the various machines used in this process located in the proper relation to one another is an important factor in the efficiency of the operation. At the Worcester shops the welding room, the grinding and layout tables and the drill press are so placed that little time is lost transporting pieces from one to the other. The machines are all near together and the path of the piece under repair is continuous from one to the next.

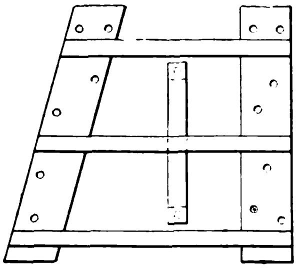
At Worcester the practice is to build up the flanges on steel wheels as fast as they wear down, until the tread of the wheel has been worn to the predetermined limit marked by a shallow cut on the wheel surface.



A Horizontal Boring Mill Used to Drill Holes in Welded Motor Cases

All worn steel wheels are repaired by means of an automatic welding machine. An accompanying illustration shows this machine at work. A pair of wheels mounted on the axle are set up in the bed of an old lathe. The axis of the lathe has been raised by the insertion of cast-iron blocks so that wheels of the largest size can be accommodated. The welding head is mounted on the lathe carriage, which has been equipped with ball bearings to permit easier movement. Height adjustment of the welding head to suit wheels of different sizes is easily made. By the adjustment of this head worn axles can also be built up in this machine.

The lathe is operated at a speed of one revolution in fourteen minutes by an electric motor running at 1,500 r.p.m. Gears from an old air compressor are used to accomplish this reduction in speed. It requires about eight hours to build up the flanges on a pair of steel wheels and two hours more to turn them down to the proper contour.



This Jig Is Bolted to the Pole Pieces of a Motor Case When the Case Is Being Redrilled

It is estimated by the company that this process adds 50,000 miles to the life of the wheel and has reduced by 30 per cent the expenditure for steel wheels. An annual saving of nearly $6,000 has been accomplished. Wheels are scrapped only after a personal inspection has been made by the master mechanic. It is now planned to reclaim many old wheels which were taken off and stored for scrapping prior to the installation of the automatic welding apparatus.

Welding is done at these shops in individual rooms specially built for the purpose. There are at present two automatic welding rooms and three for ordinary arc welding. One man, however, operates both of the automatic machines and has spare time besides. The doors of the welding rooms are heavily curtained and the insides are painted with G.E. No. 881 ultra-violet ray protective paint. An overhead trolley system with traveling chain hoists is used to transport heavy material to and from the welding rooms. It is felt that safety from eye injuries to other workmen and better quality of work by the welders result from having individual welding rooms.

Another important phase of the reclamation program being carried on by the railway is that of modernizing motor cases. In particular it was desired to convert the old type No. 101 motor cases to the more up-to-date 101-B2 type. The holes in the old cases were filled in by welding and rebored with 1¼-in. diameter instead of 1-in. as before. The old 1⅛-in. hole for the armature housing was filled in and two new ones built up by bending a piece of ¼-in. iron to circular shape and filling with welding metal.

All bearing fits and housing fits were filled in and then rebored. Gear case supports were built up by welding. New fields and rewound armatures were installed where needed. This reconstruction included the elimination of the old mica brush-holder insulators and made possible the use of a more modern type of brush-holder.

Many motor cases have been reclaimed also by the Springfield Street Railway in its own shops. After the holes in the old cases had been filled with welding metal and all worn parts built up the contact surface of each half of the motor shell is carefully planed down. No equipment is available for doing this in the railway shop at Springfield, and such work is therefore sent out to a near-by machine shop.

A novel jig is used in the process of reboring these motor cases. This consists of two pieces of ¾-in. sheet steel held together by other steel cross members, as shown in the accompanying sketch. The various pieces are riveted together. Holes have been made in the heavy steel to correspond with the holes to be drilled in the case. On account of the thickness of the material used in this jig no reinforcing plate is required around these holes.

The method of procedure for this work differs materially from that employed in reclaiming truck parts at Worcester, as already described. By means of the center strip the jig is bolted firmly to the pole pieces of the motor case. The case is placed in a Lucas Precision horizontal boring machine, as shown in the illustration on this page, and the holes bored. About three cases, or one and a half motors, can be drilled in a day on this machine. More than 400 motors have already been overhauled in this way and put in good, serviceable condition.

Ciment Fondu Proves Unsuccessful for Grout

A RECENT inspection made by the Boston Elevated Railway of paving laid on Main Street, Charlestown, Mass., and grouted with Ciment Fondu indicates that the grouting in between the blocks has disintegrated. When this paving was laid in September, 1923, the railway did not have on hand a sufficient quantity of Ciment Fondu to use it for the concrete paving base. It was, therefore, used only to cover the granite block surface.

When the grout was mixed it was bluish black in color and oily or greasy in appearance. It flowed and worked liked ordinary cement. Equal parts of cement and sand were used in the mixture. The work was completed at 3 p.m. and by 8 o'clock the following morning the pavement had the appearance of having set for three or four days. It was then firm enough to receive vehicular traffic.

An inspection was made of this paving on March 29, 1924, after it had been in service for 187 days. It was found that the grout had entirely disappeared from the face of the paving blocks and from the joints between the paving blocks to a depth varying from ½ in. to ¾ in. After the dirt which filled these joints had been removed it was found that the grout was chalky white in appearance and was easily scored with a pointed tool. It did not seem to possess the degree of hardness of ordinary portland cement grout. From the tests it would appear that this French cement is not adaptable for grout paving.

In another instance, however, the railway reports that it proved more satisfactory. A small amount was used during the construction of a sewer, where on account of the tides and the inability of the contractor to keep the ground water below the level of the manhole inverts it was impossible to use ordinary cement because every tide washed it out from the joints. A small amount of Ciment Fondu was successfully used on three of the manhole inverts because this cement sets so quickly that a fairly firm set was secured between tides.

Compromise Joint Plates Made by Welding Shims to Angle Bars

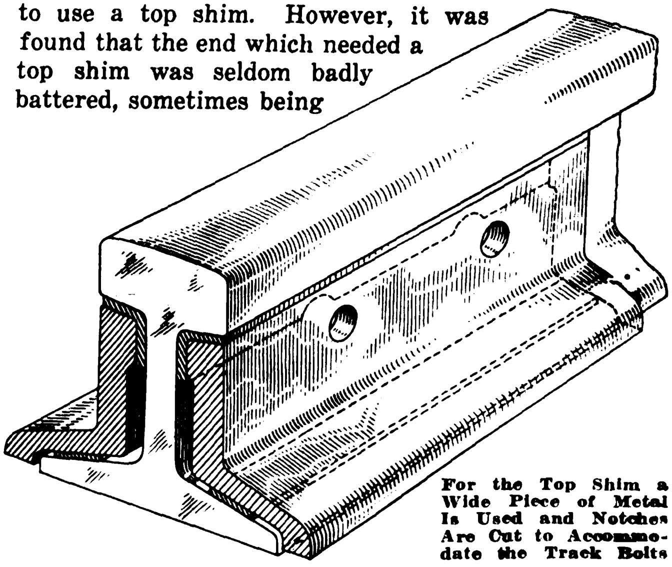
The Great Variety of Rails Which Were Used on a Small Railway Made a Difficult Repair Problem

BECAUSE of battered joints it became necessary a short time ago to repair 3 miles of track on a small Southern railway. A miscellaneous assortment of material, including many kinds of rail, had been used in the original construction of this line, which had been sponsored by real estate men more interested in the development of a tract of land than in the construction of an electric railway. The great variety of rail sections made joint repairs a difficult problem and the method finally decided upon was the use of compromise joint plates made by welding shims to angle bars.

Although approximately four out of five of the joints were composed of rails of different sizes, and a great improvement could have been effected by taking up, sorting out and relaying the rails, it was felt that such a method would be too expensive. So many kinds of compromise joints had to be made that it was out of the question to buy angle bars to fit. Moreover, it was found virtually impossible to weld such bars satisfactorily to the rail. In many cases on low T-rail, and in all cases where the bar was too small for the rail, the top edge of the angle bar was hidden beneath the ball of the rail. The plan of turning the angle bars bottom side up and welding them in that position was thought to be unsatisfactory, because the fit was likely to be very poor with such a great variety of rails in use. To take up the rails and cut off the worn ends would have been very expensive. Moreover, with so many different sized rails in use, satisfactory joints could not have been made after the rail ends were cut off. But by using the rail in the same length as it was originally made and bringing the joints even by the use of shims a smooth running surface was attained at moderate cost.

In order to make the joints tight in repairing these 3 miles of bad track, shims of various sizes were used on top of or underneath the angle bars, or sometimes at both the top and also the bottom. The material used varies in thickness from 1/16 to 3/16 in., and in width from 1¼ to 1½ in. The top shim was welded to the angle bar after the joints had been made up, except in cases where the shim was wide enough to reach down on the inside and be held in place by the track bolts. In that case openings were cut in the edge of the shim the same distance apart as the bolt holes, as shown in the accompanying illustration, and after the bolts were in place no movement of the shims was possible. The lower shim usually was welded either to the underside of the angle bar or to the base of the rail. Long shims used on the bottom were sometimes not welded but were cut about 4 in. longer than the angle bar and the ends bent over after the joint had been made up. In this way they were prevented from working out endways when the track bolts loosened.

At first thought it might be considered better practice to build up the head of the rail by welding rather than to use a top shim. However, it was found that the end which needed a top shim was seldom badly battered, sometimes being entirely uninjured. There was often a difference of 3/16 in. in the thickness of the balls of adjacent rails. It was therefore decided to bring the rails into line by the use of shims rather than by extensive welding. In some instances the use of a top shim was avoided by cutting down a large angle bar to exact size with a blow torch.



For the Top Shim a Wide Piece of Metal Is Used and Notches Are Cut to Accommodate the Track Bolts

On open joints the welding was usually done during the heat of the day, the angle bars being left loose until the joint closed up. A week or so later the joints were tightened again. Special attention was given to hammering the weld during the application of the metal, thus hardening it and giving a better running surface.

Where the angle bars were worn only on the top in the center, welding metal was added to correct this defect before the bar was used, so that the finished joint would have no tendency to sag.

Joints repaired by this method five years ago have remained in good condition on open track with the bolts being tightened only three times. It was expected when this work was originally undertaken that it would be at best only a makeshift job. Accordingly, only the worst battered joints were built up with the electric welder, because the company had no grinder, but as the work progressed, the results were much more satisfactory than could have been anticipated. The car wheels make but slight noise in passing over these joints, and the cars ride very smoothly. The use of this method has been extended, and the cost of fixing joints is less than it would be for labor alone to take up and re-lay the rail.

Commercial and Research Department Feature Pittsburgh Organization

A Distinct Sales Organization with Executive Powers Has Been Formed to Cover Fares, Service and Relations with the Patrons—Research Department Will Be Source of Data for All Other Departments

ON FEB. 1, 1924, the receivers of the Pittsburgh Railways were discharged, the property was returned to the Philadelphia Company and the railway reorganized along lines that would make it correspond more closely to a truly commercial organization of modern type. The two features of immediate import are the new commercial and research departments, the first to sell the goods ordered from the transportation department and the second to serve as the data reservoir of the company at large. The commercial department will be broader in scope than the pioneer American one of the Chicago Rapid Transit Company, while the research department is practically new in American electric railway organization.

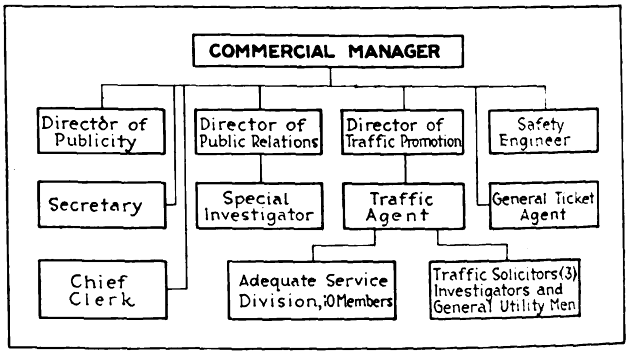
These changes are in accord with the ideas of Thomas Fitzgerald, general manager, who has long been on record as a believer in the doctrine that the words "public service" as applied to a railway mean the serving of the public to the utmost degree consistent with financial stability. This doctrine he put into specific form some four years ago (see ELECTRIC RAILWAY JOURNAL, May 15, 1920) when he suggested that the correct basis for rewarding a mass transportation concern is to pay it a profit in proportion to its popularity as a common carrier. The commercial department is the tool for making this modern conception of service effective.

W. H. BOYCE COMMERCIAL MANAGER

No understanding of the commercial department would be complete without some sketch of the experience of the personnel. W. H. Boyce, commercial manager, is no stranger to the industry. For many years he was general manager of the Beaver Valley Traction Company, also a subsidiary of the Philadelphia Company. His work in the Beaver Valley in public relations, in safety pioneering and in fares is nationally known. Few managers have so largely enjoyed the confidence of regulatory bodies. One marvels at the celerity with which changes in rates have been granted to the Beaver Valley Traction Company, no matter how novel the kind of fare was at the time. Short-haul fares, weekly passes, emergency ticket rates, off-peak reductions on special days have been granted practically over night because of the commission's experience that the applicant had at heart both the public and the investor's interest. This background is already proving invaluable in the larger sphere of the Greater Pittsburgh district.

As detailed on the "Personal Items" page of the April 5 issue, the commercial manager is assisted by a staff of men who are already familiar in detail with the Pittsburgh system. F. R. Cogswell comes by the place of director of traffic promotion through his intimate knowledge of Pittsburgh routes and travel habits. J. B. Donley, director of public relations, knows the press and the various city departments, whose cooperation is so desirable, as only a native can. C. C. Gillette as traffic agent supplements Mr. Cogswell in this wise:

Cogswell says that there is business to be obtained at such and such a time over such and such a route provided the transportation department has the men and cars available. Whereupon it is Gillette's part to determine whether suitable facilities can be provided by the transportation department, whether sufficient power is available, whether freight will not interfere, etc. From this it will be seen that the commercial department acts precisely like the sales organization of a private concern, sales and manufacturing functions being entirely distinct.


COMMERCIAL MANAGER
Director of Publicity
Director of Public Relations
Director of Traffic Promotion
Safety Engineer
Secretary
Special Investigator
Traffic Agent
General Ticket Agent
Chief Clerk
Adequate Service Division, 10 Members
Traffic Solicitors (3) Investigators and General Utility Men

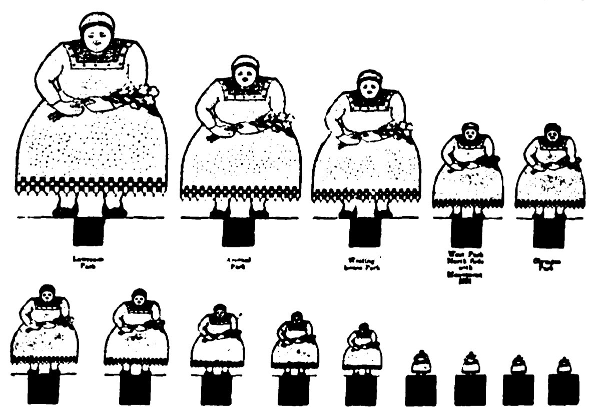
Organization Chart of the Pittsburgh Railways Commercial Department

Other commercial department duties disclosed in the organization chart reproduced herewith are those relative to adequate service, traffic solicitation and investigation. J. E. Davis, as chief of complaint adjustment work with the title of special investigator, has put this work on a much higher plane than hitherto, as may be guessed from reading the details of his formal and professional education.

In addition to the general ticket agent, W. G. Stern, the commercial department will soon be expanded in certain other directions, close to public relations work, as will be revealed in due time.

CONSTRUCTIVE WORK DONE FROM THE START

For several years preceding the reorganization, Arthur W. Thompson, president, had spoken before numberless civic bodies on the now effective traction agreement that would make the Greater Pittsburgh municipalities a real partner and co-manager in the enterprise of mass transportation. Through this work the general public attained a high degree of understanding and interest in the traction problem. It follows that when the new management took hold the public expected to see some tangible proofs of the company's sincerity. New cars were ordered and other improvements begun as had been promised, but naturally enough there was a keen desire for immediate action in regard to fares and service conditions.



"Note How, Pittsburgh's Small Neighborhood Parks are Overcrowded. While its Large Parks are Hardly Used At All."

Copyright—Citizens Committee on City Plan

We Can't Take the Parks to the People
But We Can Take The People To the Parks

THE Chart above, from the splendid "Parks" report of the Citizens Committee on City Plan, shows how few Pittsburgh people are getting enjoyment from their largest and finest Parks.

This Committee has found that only two-fifths of the people live within a 15 minute walk to the parks.

We cannot bring the Parks to your door; but we can take You and Your Family to the gates of the Parks, if you will take advantage of the following

Lower Trial Fares

Available on Sundays

From APRIL 13th *to* JUNE 29th *Inclusive*

On Sundays only from April 13th to June 29th inclusive the limits of the present "special" transfer issued on a 10 cent cash fare will be extended to the limits of the first fare zone, so that one 10c fare will take you from any part of the first fare zone across the downtown section to any part of the first fare zone on the other side. On routes which do not reach the downtown district, suitable transfers will be issued to permit this trip.

The regular limits of this "special" transfer issued on a 10c cash day fare, considering Downtown Pittsburgh as a center, are as follows:

North Side District—East Ohio Street and Herr's Island Bridge; Lowrie and Gardner; Spring Garden Ave. and Wickline St.; Rhine and Buente St., East St. and Steps near Suffolk St., Lanark and Fineview; Perrysville and Lafayette; Irwin Avenue Loop; Brighton Road and Island Avenue; California and Sedgwick; Pennsylvania and Beaver; Columbus and Fulton.

West End District—West Carson Street and Corliss; Steuben and Wabash; Main and Wabash.

South Side & South Hills District—Grandview and Oneida; P. R. of W. and Westfield; West Liberty Ave. and Brookside Ave.; P. R. of W. and Reflectorville; Chalfont and Gearing; Beltzhoover and Charles; Warrington and Arlington; South 18th St. and Monastery; East Carson and South 25th St.

East End District—Second Ave. and Bates St., Frazier Street Loop, Forbes St. and Carnegie Library, Fifth and Bellefield Aves., Center Ave. and Bigelow Boulevard; Liberty Ave. and 38th Street, Penn Ave. and 38th Street; Butler and 38th Streets; Wylie and Erin Street.

YOU Don't Have to Walk to the Parks or Stay at Home. Ride the Trolleys to the Beautiful Open Spaces of Our Great City. These Routes Will Take You There Direct or by Transfer.

RIVERVIEW Route 8	**GRAND VIEW** Route 40
FRICK WOODS Routes ... 63, 64, 67	**HIGHLAND PARK** Routes 71, 73
SCHENLEY PARK Routes 63, 64, 67, 68, 71, 72, 73, 75, 76, 79, 80	**NORTH SIDE PARKS** Routes 2, 3, 4, 6, 7, 8, 10, 13, 14, 15 18, 19

You Patronage Will Help to Make These Trial Fares Permanent

PITTSBURGH RAILWAYS COMPANY

Commercial Department

"Live In and Expand Your Business in Greater Pittsburgh"

Announcement of Special Sunday Fares to Take People to the Parks

In appreciation of this feeling, the commercial department has been inaugurating various forms of relief as rapidly as the condition in each case can be analyzed and the necessary material aids (such as the printing of new transfers) arranged. The transfer situation has been especially complicated because of the topography of Greater Pittsburgh, intercompany relations and the necessity of dealing with a very large number of political units ranging from Pittsburgh City, with more than 600,000, to boroughs with only a few hundred inhabitants.

One of the first jobs, therefore, has been to liberalize the transfer situation so that there would be more consistency in the privileges granted both ways and to remove various inequalities that gave residents of one area much less freedom than their neighbors. As it would be a futile task to describe these transfer reliefs in detail, it will suffice to say that several score have already been granted. Each additional privilege has brought many hundreds of persons into a friendlier state of mind toward the company and produced a willingness to be forbearing as regards other changes that will require more time and involve greater revenue.

It may be remarked in passing that some of the transfer reliefs are of the sort on which it is possible to double back. This does not cause the commercial department any deep concern, as both the traffic records and common sense indicate that the preponderant majority of the riders have no interest whatever in doubling back. In other words, the management does not wish to disoblige 100 legitimate users of a transfer because of five illegitimate users; neither does it believe that it pays to set two transfer checking watchmen for every transfer misuser.

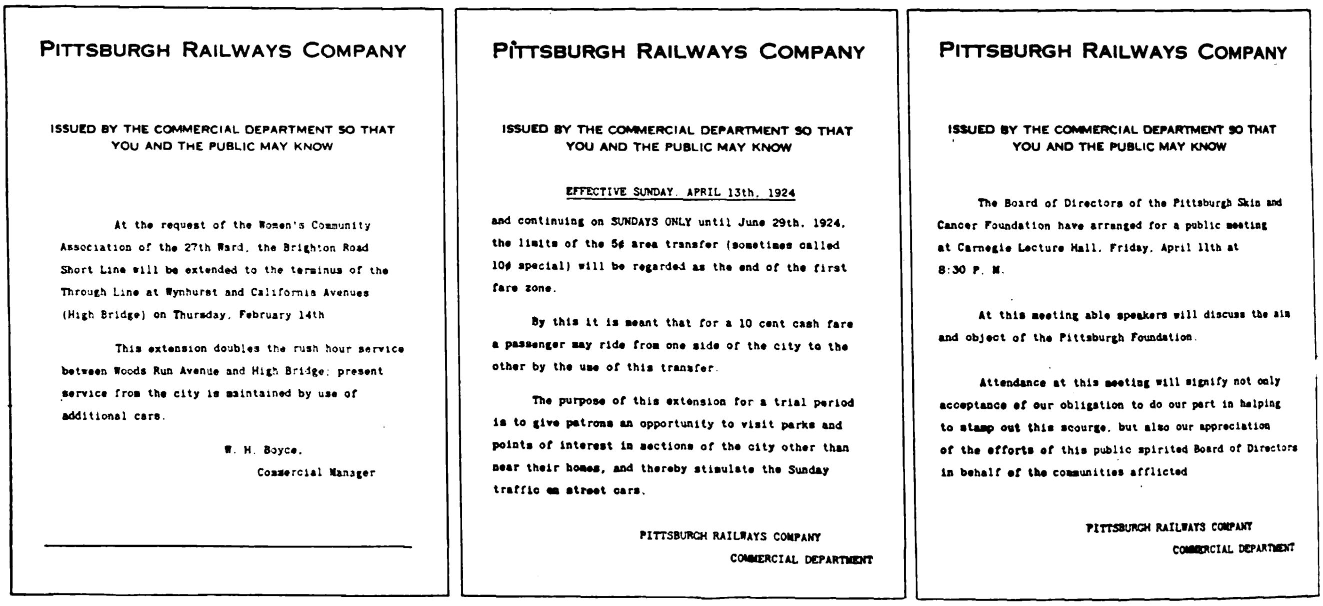
At any rate, the revenue returns so far do not show that the finances of the company have been impaired by restoring privileges of pre-war days. Few passengers were paying an extra fare, since most persons had adjusted themselves more or less willingly to the more stressful conditions.

Another step that has been accepted as evidence of good will is the readjustment of certain zone limits. In the case of a Carnegie line, a new transfer privilege has cut down the charge to Pittsburgh by a full one-zone fare. At McKeesport, a zone limit was extended to bring riders directly into the heart of the business and amusement center. The old limit did not force an extra fare from the riders, but did cause them considerable annoyance in bad weather or when laden with shopping bundles. Likewise, other zone boundaries have been shifted so that the limits would come at natural traffic points. In these and other fare studies the department has been aided by Walter Jackson as consultant.

A scanning of the passenger regulations showed some that could be placed on a "dealer and customer" rather than a monopoly footing. The basic token fare of 8⅓ cents is sold three for 25 cents. It may happen, sometimes, that a patron brings two others along and wishes to pay for all three without the extra motions of handing a quarter to the conductor, getting three tokens back and then dropping them into the box with due ceremony. The direct action of dropping the quarter into the box is now permissible, the customer's convenience being held superior to a microscopic accounting error in the relative number of 10-cent cash and 8⅓-cent token riders.

A more common occurrence is the absent-minded passenger who drops too much money in the box. In this instance the management feels that its conductors certainly can be trusted a half dollar's worth anyway; hence the new regulation that conductors may refund at once any excess up to and including 50 cents. The only stipulation is that they turn in the forgetful customer's name and address.

Mr. Boyce had gratifying success with this plan on the Beaver Valley. The daily Pittsburgh records show that the new rule is much appreciated by conductors as well as riders. It goes without saying, also, that the passenger is glad to get his money at once without being expected to visit the railway office.



Pittsburgh Railways Company

ISSUED BY THE COMMERCIAL DEPARTMENT SO THAT YOU AND THE PUBLIC MAY KNOW

At the request of the Women's Community Association of the 27th Ward, the Brighton Road Short Line will be extended to the terminus of the Through Line at Wynhurst and California Avenues (High Bridge) on Thursday, February 14th

This extension doubles the rush hour service between Woods Run Avenue and High Bridge; present service from the city is maintained by use of additional cars.

W. H. Boyce,
Commercial Manager

Pittsburgh Railways Company

ISSUED BY THE COMMERCIAL DEPARTMENT SO THAT YOU AND THE PUBLIC MAY KNOW

EFFECTIVE SUNDAY, APRIL 13th, 1924

and continuing on SUNDAYS ONLY until June 29th, 1924, the limits of the 5¢ area transfer (sometimes called 10¢ special) will be regarded as the end of the first fare zone.

By this it is meant that for a 10 cent cash fare a passenger may ride from one side of the city to the other by the use of this transfer.

The purpose of this extension for a trial period is to give patrons an opportunity to visit parks and points of interest in sections of the city other than near their homes, and thereby stimulate the Sunday traffic on street cars.

PITTSBURGH RAILWAYS COMPANY
COMMERCIAL DEPARTMENT

Pittsburgh Railways Company

ISSUED BY THE COMMERCIAL DEPARTMENT SO THAT YOU AND THE PUBLIC MAY KNOW

The Board of Directors of the Pittsburgh Skin and Cancer Foundation have arranged for a public meeting at Carnegie Lecture Hall, Friday, April 11th at 8:30 P. M.

At this meeting able speakers will discuss the aim and object of the Pittsburgh Foundation.

Attendance at this meeting will signify not only acceptance of our obligation to do our part in helping to stamp out this scourge, but also our appreciation of the efforts of this public spirited Board of Directors in behalf of the communities afflicted

PITTSBURGH RAILWAYS COMPANY
COMMERCIAL DEPARTMENT

Three Samples of the "Blue Letters" Issued to Employees of the Various Pittsburgh Subsidiaries of the Philadelphia Company

SPECIAL INTERURBAN THEATER AND PITTSBURGH SUNDAY FARES

Two other instances of early constructive work on the part of the commercial department are the reduced fares put on for interurban and city riders during slack periods.

On the two interurban lines round-trip theater-time tickets are being sold at one and one-third times the one-way rate, provided the inbound trip is started at approximately 6:30 p.m. from the farther stations and return is made the same night. So far the desired publicity and personal co-operation with Pittsburgh theater interests has not been worked out to obtain full benefits from these tickets, but in the meantime the patrons of these lines have something pleasant to say about the "commercial department," whose title appears on all announcements of the character described.

Beginning April 13 the company is trying a "Sunday only" liberalization of the 10-cent crosstown fare. Ordinarily, this special transfer is good within a rather restricted distance on each side of Pittsburgh center. The Sunday rate carries the user all the way up to the limit of the one-fare zone if so desired. This rate will be in effect on all Sundays to June 29, inclusive. It is hoped that riding to the parks, to the churches and to family reunions will be especially stimulated. Sunday traffic in Pittsburgh is so far below everyday riding that a trial of this kind is quite logical.

As for the probable popularity of the Sunday reduction, one instance is of interest. A woman called up the commercial department to make sure that the 10-cent special really would enable her to reach a favorite church on the other side of town. She was delighted to learn that the 10-cent fare would cover the trip and added that this meant three companions as well. The oddest part of the story is that the limits of the week-day 10-cent special actually were liberal enough to make the same trip any day, but owing to absence of publicity she did not know this to be the case. As regards the Sunday innovation, the people of Pittsburgh have not been left in doubt, for the company ran half pages in the dailies for three days before the new privilege became effective. This particular advertisement stressed Sunday travel to the parks, but in other seasons the emphasis will be on travel to indoor entertainments or other edification.

"SO THAT YOU AND THE PUBLIC MAY KNOW"

Not the least interesting example of the commercial department spirit is the style in which the different regulations are placarded and otherwise made known. Every effort is made to get away from the unconsciously arbitrary wording of so many railway announcements. A feature in harmony with President Thompson's policy on the other subsidiaries of the Philadelphia Company in Pittsburgh is the broadcasting of a "blue letter" from the commercial department to the officers and petty officers of the affiliated companies, aside from the railway circulation of the same letter. The purpose of this outside circulation is to help these hundreds of men to give a satisfying answer to the inquiry of friend, neighbor or stranger on these changes.

An important point about the "blue letters" is that credit is given to the customers for changes in regulations. Some of these blue letters are reproduced herewith, omitting a small picture of a street car which is printed on the blue letter just under the company name. In this simple way it is brought home to the man who reads the letter, whether at home or on the carhouse bulletin board, that the management is not above accepting suggestions from its customers and its employees and that when such suggestions are found acceptable due acknowledgment will be made.

HOW PRESS AND PUBLIC SHOW APPROVAL

Up to the present the transfer reliefs seem to have made the strongest impression on the public at large. An editorial approval was one of the first signs, and this has been reinforced by many letters, telephone calls and personal visits from individuals. It is remarkable, also, how large a proportion of the comments that reach the department in these several ways is of a constructive nature. Very few demand an immediate return to a 5-cent fare and the additional ideal of a seat for every passenger every time. The average person is shown to have a pretty clear grasp of the company's financial problems as a whole. If he suggests a transfer here or a lower fare there it is generally with an argument that his personal observation indicates that the company would make more money thereby. He has got over the idea that more money isn't a necessity.

Many of these suggestions are being considered carefully, for it is realized that the person who travels a given territory day after day has a viewpoint that may escape the professional operator. In any event, the collective wisdom of the riders and of the platform men is worth seeking and trying.

It is true that none of the innovations hitherto made affects the majority of the riders. They are but the forerunners of bigger and better events. For such greater changes it is necessary to build up a foundation of public confidence. This is just what is being achieved. Each change or experiment is along the line of the public's desires. The change may not be important enough in itself to show a tangible financial result up or down, but it makes a new group of friends in a new part of the territory.

Nor are these friends being made only through the changes described. The handling of complaints by personal calls from men of culture and refined address and the department's courteous request that telephone complainants give their name and address to permit the immediate mailing of refund tokens are policies bound to have a happy cumulative effect. Many persons are satisfied to turn in a complaint and let it go at that. Laborers and other patrons of limited means are exceptionally pleased when they find an investigator calling in person because adjustment by telephone or letter was not practicable.

RESEARCH DEPARTMENT TO BE GENERAL DATA SOURCE

The research department, now being organized, with A. C. Spurr as research manager and A. H. Leschke as research engineer, as yet is not quite so advanced in staff and scope as the commercial department. Hence, a full description of its work is impossible. The general plan is that this department shall serve as a study and statistical organization for the other departments of the company. For example, as motor-bus operation is a live topic, this department is gathering all pertinent data for submission to the motor-bus committee so that the latter can get at the subject without using time in digging for details. Such information is gathered partly from the printed page, partly by correspondence and partly by direct visits. A feature emphasized by Mr. Fitzgerald is that this department will have many opportunities to relieve the different departments of the disturbance of routine that arises when some particular report must be prepared in a hurry. Instead of pulling men away from their daily jobs, the required material can be requested from the specialists who know just where to look for the facts—whether outside or inside the company—and how to put them together to greatest advantage. Such a central bureau in the course of the year will save a great deal of repetition of labor.

The relationship of the research to, say, the commercial department can be illustrated by just one item. The research department and not a clipping bureau reads the local newspapers that come to the office. Therefore, they are read with intelligence and between the lines. In this way the commercial department will be kept apprised of developments in building, in future exhibits, conventions, etc., and all other items that will assist the creation and increase of riding travel at a profit to company and community alike.

Benefits of the Hospital Association Are Extended

PLANS extending the benefits and activities of the Illinois Traction System Hospital Association to all the properties of the Illinois Power & Light Corporation have been completed by trustees of the organization. The name of the Illinois Traction System Hospital Association has been changed to Illinois Power & Light Hospital Association.

The Illinois Traction System Hospital Association was organized in July, 1907, by employees of the Illinois Traction System, now one of the properties of the Illinois Power & Light Corporation. It was formed for the hospital care and treatment of employees of the big interurban system, the workers paying each month a small assessment for dues. Deficits were made up by the company.

In July, 1910, it was decided to extend the scope of the hospital association's activities by adding death benefit and total disability features.

The employees who were members of the hospital association were eligible to join the fund providing they passed the required examination.

The first assessment or dues for employee members amounted to $536, but the Illinois Traction and its subsidiaries added to the fund and made it possible to pay $800 for the first death in July, 1910.

The management then announced that as soon as the dues or assessments amounted to $800 it would make up the difference and make it possible to pay $1,000. The first $1,000 was paid in June, 1913. The death benefit and total disability fund has been paying $1,000 for death or total disability from that time to date as the assessments or dues amount to more than $800 each month.

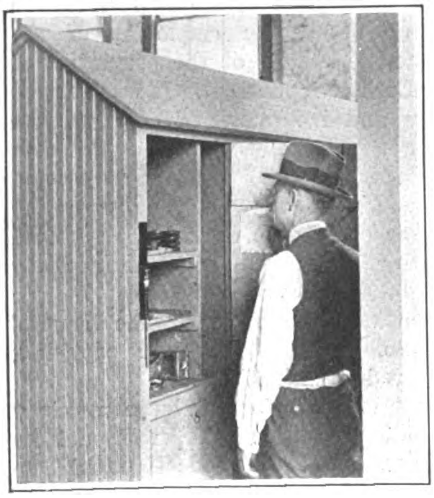
The assessments and dues for the hospital association as well as the death benefit and total disability fund are based on the monthly wages of each employee. Therefore, each contributes to this fund according to the amount of wages he receives, the higher salaried man, of course, paying the larger amount, but all receiving equal benefits.

To make all of this possible the Illinois Traction and its subsidiaries, since the beginning of the association, have contributed more than $80,000.

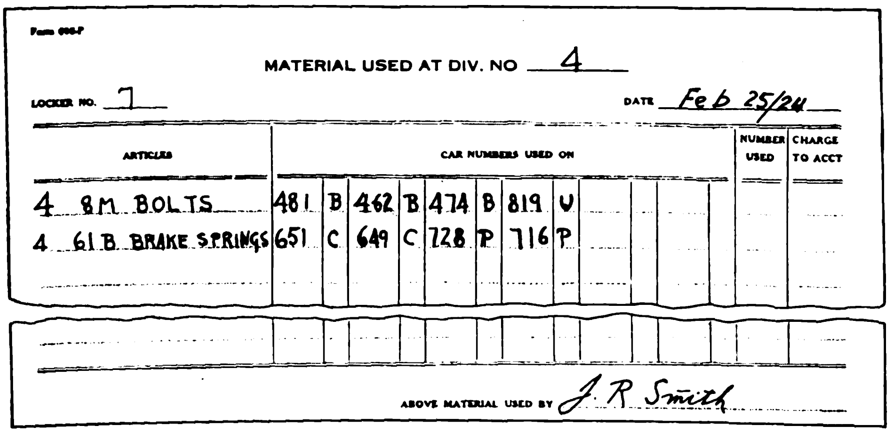
Equipment Maintenance Notes

Saving Expense of Night Storekeeper

IN THE shops of the carhouses of the Los Angeles Railway a system is in use which makes it unnecessary for each night mechanic to draw his necessary supplies from the storeroom. This saves the expense of a night storekeeper's salary. Each night mechanic has a separate locker and is assigned to definite work. For example, one man may have charge of a certain amount of brake repair. His locker is then kept supplied with material necessary in his work. A card form is kept in a holder inside the locker door and the mechanic notes on this card the materials he uses. Next morning the day storekeeper makes the rounds of the lockers and replaces the articles which the card shows were used on the previous night. The storekeeper removes the card for his records and places a new blank in the holder.



Lockers Where Night Mechanics Keep Materials for Their Work



Form 606-P

MATERIAL USED AT DIV. NO 4

LOCKER NO. 7

DATE Feb 25/24

ARTICLES	CAR NUMBERS USED ON												NUMBER USED	CHARGE TO ACCT
4 8M BOLTS	481	B	462	B	474	B	819	U						
4 61B BRAKE SPRINGS	651	C	649	C	728	P	716	P						

ABOVE MATERIAL USED BY J. R. Smith

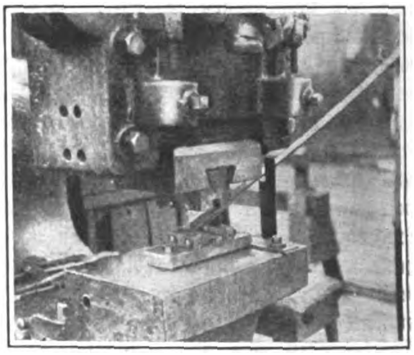
Card Used to Inform Day Storekeeper What Supplies Were Used the Previous Night

Forming Controller Tips on Power Punch

AT THE Harvard shops of the Cleveland Railway use is made of a 200,000-lb. power punch to cut and form the burning tips used on controllers. The dies and fixtures are so arranged that it is possible to cut the tips with the proper bevel at the ends. After a sufficient number are cut, a curved piece is inserted in the die, which forms the individual piece to the proper curvature and at the same time offsets the end which fits under the controller segment.

On the base of the punch is mounted a grooved die into which the cutting and forming die fits. The rear portions of these dies are used for the "cutting off" operation, the copper bar being held in the proper position by two guides mounted on the base of the punch and by an elongated floor rest at some distance from the machine. In this operation it is necessary to turn the material over after each cut in order to give the proper bevel to each end of the tip.

For the curving and offsetting operation a concave die with a shoulder is fitted in the slot in the die holder attached to the base of the punch, while a convex die is fastened to the punch head. The tips are placed on the concave die and are formed and offset by the pressure applied by the punch.

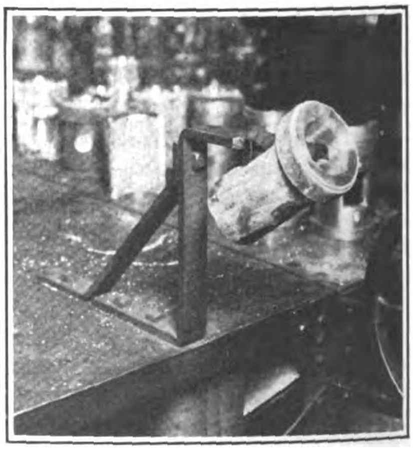


Cutting Controller Burning Tips on 50-Ton Mechanical Punch; 3,000 Are Cut and Formed in 12 Hours

With this adaptation it is possible for one man to finish 3,000 controller tips in 12 hours. Formerly the offsetting operation was accomplished on a milling machine, on which only 75 of the tips were finished in the same time.

Testing Bearings for Loose Babbitt

A COMMON method of determining whether the babbitt lining of bearing shells is adhering properly is to suspend the shell and strike it a sharp blow. When bearings are well babbitted a clear metallic tone will result. The quality and clearness of the tone depend to a considerable extent on the method of suspending the bearing.

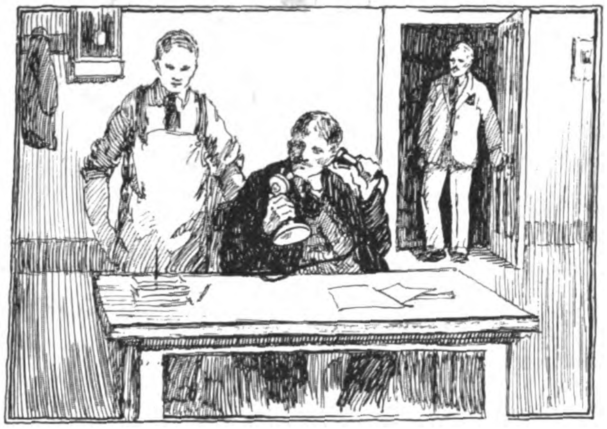


Armature Bearing in Position for Testing for Loose Babbitt on Brooklyn-Manhattan Transit System

In order that uniform results may be secured when testing

Dick Prescott Hears Half a Conversation

And a Visitor "Listens In"



"MR. MULLANEY, we're not going to be able to get that car ready for the transportation department today," said Steve White over the telephone in answer to the gruff inquiry from Thomas Mullaney, the general foreman of the Consolidated's shop.

The carpenter foreman's tone was not apologetic. In fact, it was just a little belligerent, and there was evidence of exasperation in the expression on his face. Steve's tone and expression made Dick Prescott feel uncomfortable, but they had been talking when the telephone bell rang and Dick therefore remained standing in the carpenter shop office.

So tense was the situation that neither he nor Steve was aware of the presence of the rather reserved looking gentleman who stopped in the doorway as though to ask a question, and remained waiting for Steve to finish talking. Neither Dick nor the second listener could hear the other end of the conversation, but that emanating from the little office was extremely significant.

"Yes, Mr. Mullaney, I know you said you wanted that car out today, and we did all we could to get it out, but one of the boys made a mistake in getting a piece of work done in the mill." . . .

"That's true, there's been a lot of mistakes made, but part of them have been due to the hit-and-miss way we're trying to do our work." . . .

"You bet I do, Mr. Mullaney, and I'm not the fellow that's trying to pass the buck. I know I'm responsible for what goes on over here, but I've got to have some help in the office or I can't do a bit better than I've done. I'm getting to the place where I'm ready to throw up my hands." . . .

"No, I don't want to do that, Mr. Mullaney, but I can't stay here much longer and keep on taking the responsibility for slips when I know the trouble is not with me." . . .

"I think I do watch things as closely as I possibly can under these conditions, but one man can follow only so much, and some of these things are bound to go wrong unless we get a little more system for handling our work." . . .

"Not at all! I don't want to load the shop up with any more red tape than necessary, but we'd save a lot of worry and mistakes if we planned our work a little ahead." . . .

"That's all true, Mr. Mullaney, but conditions are a lot different than they were 30 years ago, and unless we make some improvements we're going to keep on having trouble. If you'll notice, the transportation department isn't doing things like it did 30 years ago. All this talk about selling transportation, and these new ads they're running in the papers about giving service and calling the car riders customers and all that stuff, are a lot different than 30 years ago. That's one of the things that's giving us trouble. The transportation department is trying to keep all the cars it can in service and we don't have as many in the shop as we used to. That's why we've got to change our methods to keep up with the new conditions, or we're going to keep on having the same troubles we've been having right along." . . .

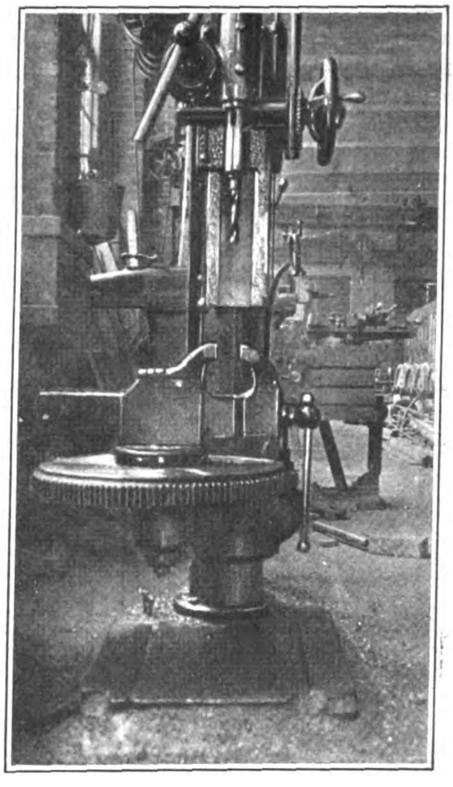
"Sure I will. I'm glad to hop to it and do all I can. In the meantime, I'll kind of lay out what I think we ought to do in the carpenter shop and mill. I've been thinking a lot about these old machines over here ever since we got up that dope for the ELECTRIC RAILWAY JOURNAL the other day, and I think we could speed up a lot and save our costs by putting in a few new machines and replacing some of these old types. I'll get my figures together and be ready whenever you want to call a meeting."

Steve White hung up the receiver, heaved a sigh of relief, and then on swinging around in his chair, noticed for the first time the gentleman who stood in the doorway, showing no outward evidence of the effect of the statements he had just heard.

bearings in this manner a special bracket has been arranged on a bench in the babbitting department of the East New York repair shops of the Brooklyn-Manhattan Transit System, on which the bearings are placed. The accompanying illustration shows an armature bearing in position for testing. The end of the bracket is rounded and is covered with several layers of canvas. With this method of suspending the bearing uniform results are obtained.

Vise Handy on Drill Table

MANY small parts are drilled in an electric railway shop, and if each one has to be clamped in position for drilling considerable time is taken. As a result it is quite common practice for the operator to hold the piece on a block with his hand while drilling. This, however, sometimes leads to accidents and is tiring to the operator where a considerable amount of drilling is done.

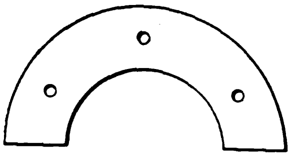


Vise Mounted on Table of Drill Press in Shops of the Philadelphia & West Chester Company

A vise mounted on the table of the drill press is found to be a great time saver in the shops of the Philadelphia & West Chester Traction Company, Upper Darby, Pa. The vise is bolted to the center of the table so that it can be rotated independently and also can be moved as the table is swung about. This enables it to be placed in any position convenient for drilling and small parts can be clamped in the vise and held firmly in an instant. More accurate drilling also results.

Cast-Iron Axle Collars Replace Fiber

THE Worcester Consolidated Street Railway, Worcester, Mass., has tried the experiment of substituting a cast-iron piece ⅝ in. thick, shaped as shown in the accompanying sketch, as a substitute for the fiber piece of the same shape attached to the axle bearing collar on Standard 050 trucks. This piece is riveted to the axle bearing collar with ⅜-in. rivets. Steel was tried at first, but cast iron was found to give equal service and is cheaper. The increased life of this cast-iron wearing plate as compared with the fiber previously used has resulted in a material saving.



Form of Cast-Iron Axle Collar

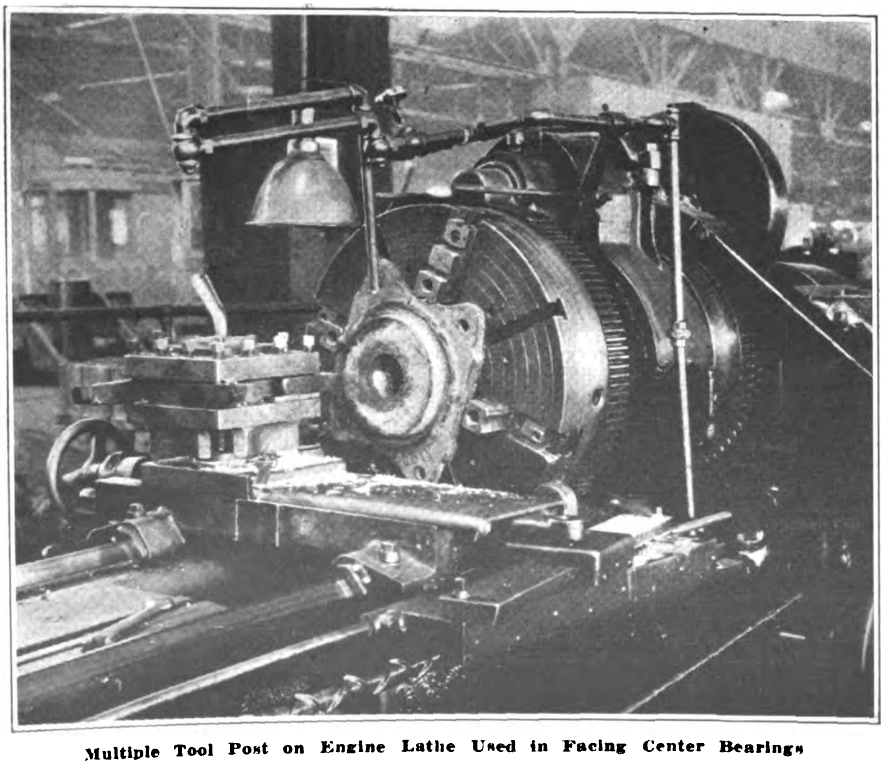
Multiple Tool Post Expedites Turning

A SWIVEL tool post capable of holding four cutting tools is used by the Pittsburgh Railways on a 16-in. lathe when facing center bearings.

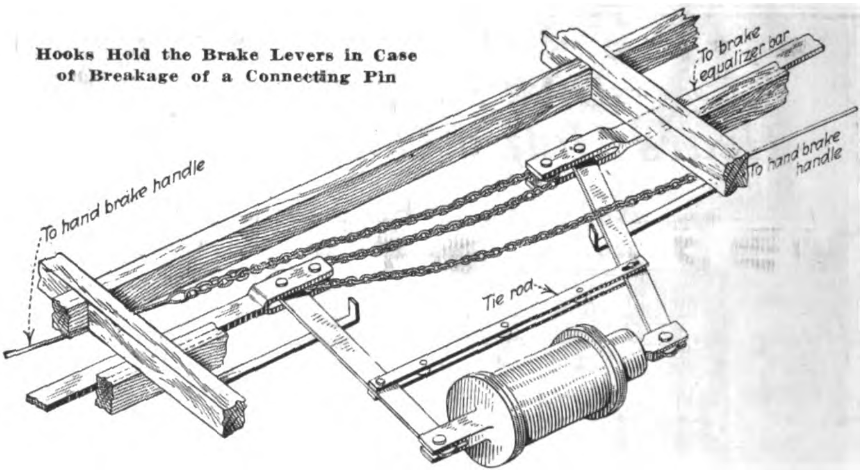
In finishing such a casting it is necessary to use more than one cutting tool because of the curvature of the bearing. Rather than change tools in the ordinary tool post, the proper tools are mounted on a swivel post.

The swivel post is about 6 in. square with a tool groove around the sides. Set screws projecting through the upper edge into the groove hold the ⅝-in. tool steel at each corner. The post is mounted on a swivel which takes the place of the compound. It is locked in place at any desired position.

This device is also used in turning operations as it reduces to a minimum delays caused by necessity to replace dull cutting points. In this use the tool post is simply turned around to the next position and the machining continued with another tool already in place.



Multiple Tool Post on Engine Lathe Used in Facing Center Bearings



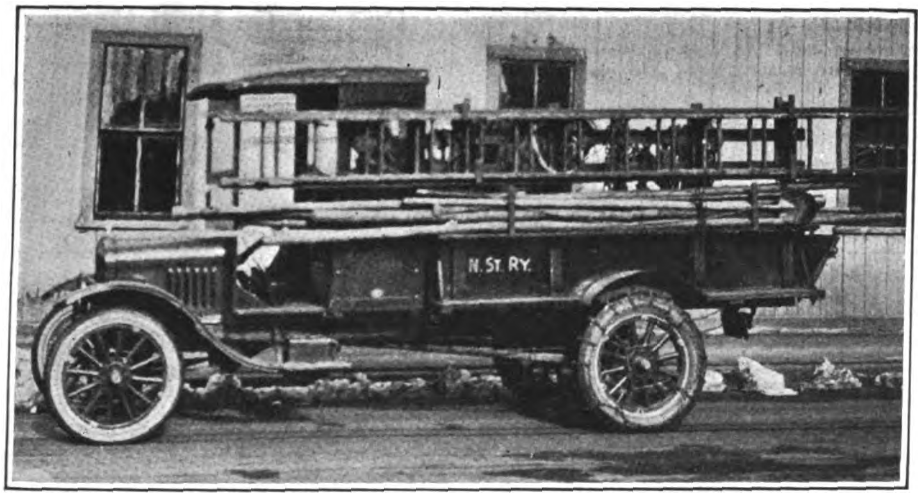
Hooks Hold the Brake Levers in Case of Breakage of a Connecting Pin

Safety Hooks on Brake Rigging

TWO metal hooks attached to the underframes on double-truck cars are used by the Union Street Railway, New Bedford, Mass., as a safety precaution in case of the failure of some part of the brake rigging. This device, shown in an accompanying illustration, is somewhat similar to that used by the Holyoke Street Railway, which was described on page 111, ELECTRIC RAILWAY JOURNAL, Jan. 19, 1924. A point of difference is that hooks made of steel strips are used instead of chains. A hook of this kind will hold the brake lever in case of breakage of a connecting pin or rod at one end of the car and prevent the brake rigging at the other end being rendered useless. Another point of difference between the practice at New Bedford and that at Holyoke is that only a single tie rod is used between the brake levers.

Novel Line Truck for Small Road

A LIGHT line truck particularly well adapted to the needs of a small company has recently been built according to plans which were prepared by the Nashua Street Railway, Nashua, N. H. A 1-ton Ford truck was purchased, and the body was built by the railway. As shown in the illustration, the sides have been equipped with hooks to carry extension ladders, poles and long-handled tools on the outside. On the inside of the truck are carried short-handled tools, tackle, etc. The method of operation when making repairs to the overhead lines is to remove the ladder from its supporting hooks, place it against the side of the truck, fasten it firmly into position and

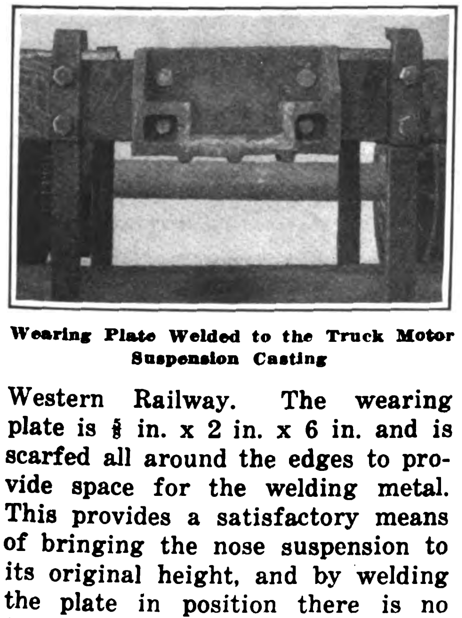


When Making Repairs to the Overhead Lines the Ladder Is Taken Off the Hooks of the Nashua Line Truck and Fastened in a Vertical Position

then extend it upward to a position where the workman can readily reach the overhead line. A convenient feature of this truck is that the sides can be removed altogether and the body used for the transportation of flat material.

Wearing Plate for Motor Suspension

THE accompanying illustration shows a wearing plate welded in position to the face of the casting used on the truck to support the nose of the motor. This method is used in the shops of the Philadelphia & Western Railway. The wearing plate is $\frac{5}{8}$ in. x 2 in. x 6 in. and is scarfed all around the edges to provide space for the welding metal. This provides a satisfactory means of bringing the nose suspension to its original height, and by welding the plate in position there is no danger of its working loose.



Wearing Plate Welded to the Truck Motor Suspension Casting

Oilers Increase Life of Bearings

THE installation of vacuum oilers on motors used by the Worcester Consolidated Street Railway and the Springfield Street Railway was begun in 1921 and has been extended continuously since that time. At Worcester 568 have already been installed and 732 more have been ordered from the Railway Improvement Company. At Springfield 560 have been installed and 476 more have been ordered. The chief advantage of these oilers has been their ability to lubricate the older types of motors which previously had an unsatisfactory oiling system.

At the present time the railway is oiling cars equipped with Ransom oilers on a 3,000-mile basis, whereas formerly it was necessary to lubricate them on a 1,000-mile basis and at times even on a 500-mile basis. Aside from the efficiency of the oiler for lubricating, this apparatus has also the advantage of keeping dirt and grit out of the bearings. Both of the foregoing tend to increase the life of the bearing, although no data are available to show just how much this increase amounts to.

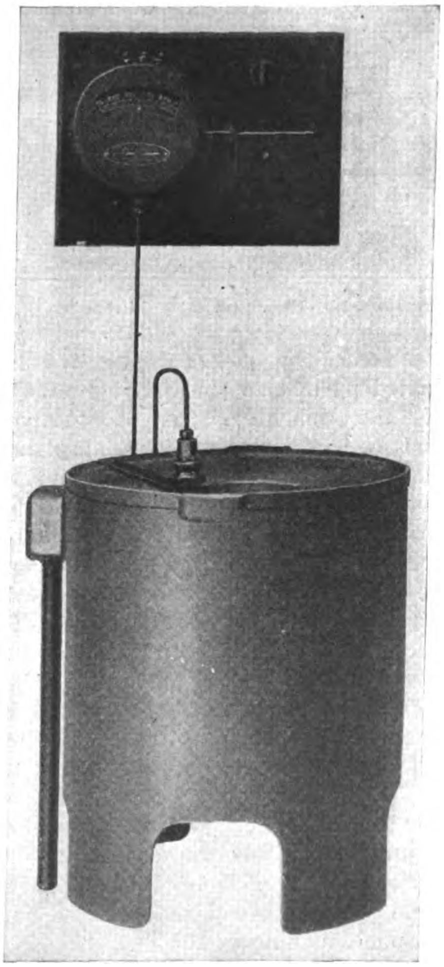
New Equipment Available

Babbitt Pots with Automatic Temperature Control

AN ELECTRIC melting pot for melting and maintaining at working temperature soft metals and alloys such as solder, babbitt, lead and zinc is one of the recent developments of the Westinghouse Electric & Manufacturing Company. This melting pot, which is made in two sizes, of 150-lb. and 750-lb. capacity, has thermostatic control that is claimed automatically to keep the temperature of the molten metal at any desired point between 450 deg. and 950 deg. Fahrenheit. A small electric motor controlled by a thermostat throws the snap switch on or off as the temperature of the metal reaches the high or low limit set by the operator, and an even working temperature is assured without further attention.

The heating element and all its conections are mounted on the melting crucible, which can be easily lifted out of its outside casing to make the element accessible. The outside casing surrounding the crucible is lined with an adequate layer of heat insulating material to reduce radiation losses and insure cool shop conditions. The control panel, which may be mounted in any convenient position, consists of magnetic contactors and suitable relays for opening and closing the line circuit. An instrument panel, which is set up adjacent to the pot, contains the thermostat with temperature regulating pointer, the push button switch for turning the current on or off, and a red signal lamp which serves as a warning in case the heat is left on accidentally.

One of the advantages of the electric melting pot is in connection with



New Automatically Controlled Electric Melting Pot the use of lead base babbitt. This metal is greatly affected by either overheating or pouring too cold and therefore can only be used where it can be poured at a constant. accurate temperature. With the temperature control possible through the use of electricity for heating, the pouring temperature can be so closely regulated that the use of lead base babbitt is made possible.

Portable Machine Cuts, Threads and Reams Pipe

A NEW portable pipe threading, cutting-off and reaming machine has been brought out by the Williams Tool Corporation, Erie, Pa. It has a handy self-contained grinder and is arranged for either motor, belt or hand drive. The motor-driven machine has a standard 1-hp. motor mounted on a hinged table in the base, the power being transmitted by belt to the driving pulley of the machine. A distinctive feature is the method of raising the motor to release the belt and stop the machine by use of a demountable hand crank. Automatic belt adjustment is provided. The machine can be converted to belt drive by removing the motor belt and driving directly from either a line or a countershaft.

Portable Pipe and Bolt Threader

The capacity of the machine is such that it will cut either right or left-hand threads on pipe ¼ in. to 2 in., and on bolts from ⅜ in. to 1½ in. inclusive. The machine will ream the inside and chamfer the outside of pipe from ¼ in. to 2 in. The longest thread that can be run at one chucking is 10½ in.

The spindle has two speeds. These are obtained by means of a set of sliding gears. A neutral position is provided so that the spindle may be started and stopped without shutting off the current. All gears are made of steel, machine cut, heat treated and run in oil. The shafts are equipped with long babbitted bearings provided with a self-oiling system.

The front gripping or driving chuck is of the three-jaw, universal, self-centering type. The carriage ways are of extra heavy seamless steel tubing, ground to size and polished. The way nearest to the operator has gear teeth milled on its surface, which engage a pinion shaft for operating the carriage. The die head and carriage are cast in one piece, which prevents the head getting out of alignment. The carriage has six babbitt-lined bearings on the ways.

The cut-off attachment is mounted on the rear of the die head and is operated by a screw and hand wheel. A V-block equipped with hardened tool-steel facings steadies the pipe when it is being cut off. On the cut-off attachment is pivoted the reamer holder, which is operated by a lever. The tool bit used for reaming and chamfering is 5/16 in. square.

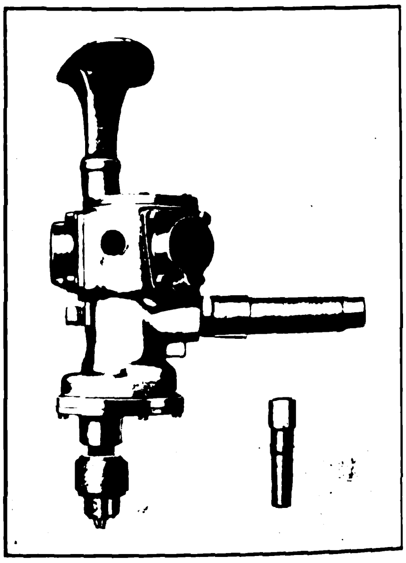
A geared rotary oil pump, located on the rear side of the machine, is driven from the intermediate shaft. The oil is pumped from a reservoir in the base of the machine through a strainer to the pump, being forced from there through a flexible hose to the die head where a three-way valve enables the operator to regulate the flow of oil. After flushing the dies and cut-off tool the oil drains back into the oil or chip pan under the die head, where it is strained before it flows back into the reservoir for reuse.

A feature of this portable machine is a high-speed emery wheel running at about 1,100 r.p.m., mounted on the pulley shaft at the rear of the machine. The wheel, which is 6 in. diameter with ¾ in. face, is driven direct from the motor. The design is such that when the operator uses the emery wheel no other part of the machine is running, giving full power to the motor for grinding.

The weight of the machine complete with motor and all standard parts is 520 lb. A special die cabinet cast in the top of the pedestal provides a safe and convenient place for storing dies and for holding any other small tools which are used on the machine.

Pneumatic Drill Has Renewable Cylinders

A NEW size, light-weight non-reversible pneumatic drill has recently been placed on the market by the Ingersoll-Rand Company of New York. It is known as size D and is suitable for drilling holes up to 9/16-in. diameter and reaming up to 5/16-in. diameter. The drill may be fitted with either breast plate, feed screw or grip handle, making it adaptable for a wide variety of work. The salient features of this device are the light-weight aluminum case with steel bushings cast in all the bearing holes and in the throttle hole, cast iron cylinders which are renewable and interchangeable, and a special three-cylinder motor. The renewable cylinders are a valuable feature, as any cylinder can be replaced easily and the motor made as good as new at slight cost.



A New Light-Weight Pneumatic Drill Made by the Ingersoll-Rand Company

The total weight of the new device, including breast plate and chuck, is 14 lb. Its over-all length is 15 in. At 90 lb. air pressure it operates at 700 r.p.m. The three-cylinder motor has the rotating parts all accurately balanced, reducing vibration and wear and tear on the machine. The drill is said to be very economical in regard to the air consumption and cost of maintenance.

The construction of this machine is very similar to that of the No. 6 and No. 600 drills which the same company brought out some years ago and which were suitable for drilling up to ⅜-in. diameter. Every part is readily accessible for inspection and their success led to the new size with larger bore and stroke.

Association News & Discussions

Accidents Analyzed and Elimination Discussed

Mr .Storrs and Commissioner Higgins Contribute Papers at Conference on Motor Vehicle Traffic at New Haven—Analysis of Connecticut Company Automobile Accidents Throws Light on Relation of Traffic to Accidents

At a Conference on Motor Vehicle Traffic, called by Yale University and held at the Sheffield Scientific School, New Haven, Conn., on April 9, 10 and 11, two papers were read that dealt particularly with problems of transportation by public service vehicles on streets and highways.

In the first, L. S. Storrs, president of the Connecticut Company, discussed the effect of congestion in downtown districts, due to automobiles, on the movement of passengers by street cars, and gave an analysis of accident statistics involving a car and an automobile. In the second paper Chairman R. T. Higgins of the Public Utilities Commission of Connecticut spoke on automotive public service vehicles, with reference to state regulation.

Mr. Storrs pointed out that automobiles owned in Massachusetts, Rhode Island and Connecticut equal one-third of the total number registered in the world, outside of the United States. Increasing congestion works a hardship on operatives by limiting the range of their movement between home and shop; it limits the supply of labor to industry, and it discourages shopping in the business centers of our cities.

Street cars are now carrying more people than at any time in the past, and there is a demand for constantly increasing facilities. The substitution of cars of larger capacity is only a palliative. The real need is for more cars, but their addition, with the increasing number of automobiles, will make the congestion on our streets still more acute.

In New Haven, 86 per cent of the passengers entering and leaving the central area are carried on street cars comprising 27 per cent of the total vehicles. The other 14 per cent use private automobiles, comprising 73 per cent of the vehicles. The accident hazard due to this congestion has received close study. While the monetary loss is of small importance as compared with loss of life or personal injury, it means an average expense to the electric railways of the United States of 4.6 per cent of the passenger revenue, or $44,000,000 a year. In Connecticut it is below the average, being but 3 per cent, or $400,000 annually.

The total number of accidents on about one-third the mileage of the country decreased from 1920 to 1922, while those involving automobiles and street cars increased 13 per cent. In Connecticut those not involving automobiles decreased from 4,889 in 1918 to 4,279 in 1923; the automobile cases increased from 3,505 to 5,258 for the same years.

Analysis of Accidents

Efforts to reduce accidents have taken the form of education of employees and, with the co-operation of the authorities, of school children, track relocation, cutting banks and brush at obscure road crossings, and introducing light-weight cars capable of stopping in a short distance.

By requiring reports on all cases, even the most trivial, the company has records of eight times as many accidents involving cars and automobiles as were listed by the Motor Vehicle Department, to which only those involving personal injury or material damage must be reported.

The following is an analysis of the 5,258 reported in 1923:

Accident	Number	Per Cent of Total
Automobile turning out from curb, hit by trolley	693	13.3
Automobile coming out of intersecting street at motorman's right	281	5.5
Automobile coming out of intersecting street at motorman's left	298	5.5
Automobile hit in rear, trying to pass moving car, same direction	522	10.0
Automobile colliding head-on with car	340	6.5
Automobile hitting standing car, excluding head-on	698	13.2
Automobile sidewiping car, same direction	624	11.8
Automobile sidewiping car, opposite direction	506	9.7
Automobile struck backing out of driveways or buildings	92	1.7
Automobile struck in rear by trolley, due to sudden stopping	375	7.1
Automobile ran into moving trolley car, same direction	224	4.2
Automobile parked, hit by car	588	11.2
Automobile hit at grade crossings	17	0.3
Total	5,258	100.0

The preponderance of accidents due to carelessness on the part of the automobilist is noteworthy. The largest number are those occurring when automobiles were pulling out from the curb, probably due to the frequent neglect to give a signal. On wide streets this type of accident practically vanishes.

Vehicular congestion in the central portion of our cities leads to numerous minor accidents, mostly to pedestrians; it affects all residents who have occasion to visit the business districts, and warrants most careful consideration by expert examiners.

A survey in St. Louis showed 9,842 vehicles entering the business district daily, while parking area is available for only 2,500. In Chicago 51.3 per cent of vehicles entering the Loop district are autos carrying 18.9 per cent of the passengers. Two per cent are street cars carrying 74 per cent of the passengers. Figures for New Haven have been given, from which it appears that 86 per cent of passengers are being inconvenienced for the other 14 per cent who average not over 1.75 per automobile.

Commissioner Advocates Bus and Truck Regulation as Means of Reducing Accidents

Mr. Higgins pointed out that the automobile has established its permanency in the transportation field, in recognition whereof the Connecticut Legislature in 1921 declared motor vehicles operated in such manner as to afford transportation similar to that afforded by street railways to be common carriers and subject to public regulation.

Under this act bus routes have been established totaling 672 miles, mostly in suburban and interurban territory. Operation has been authorized of 239 cars, touring and bus types, in addition to 53 buses operated by street railway companies.

It would be unwise seriously to impair the usefulness of railroads and railways, which have demonstrated their necessity in the activities of our country, by allowing destructive competition. But the public service motor vehicle will become a still more important agency in intrastate, and somewhat in interstate, transportation of freight and passengers, because of improvement in mechanism and flexibility of service.

They should then be under public regulation and control. At present only the jitney is under such control, while the numerous freight trucks are without any public regulation.

Under its broad jurisdictional powers the commission has prescribed rules, the violation of which may be followed by revocation of certificate. This circumstance has been a strong incentive to careful operation. Since the law went into effect, July, 1921, there has been but one fatal accident, and that one not due to the jitney operator.

Motor vehicle transportation should come under state control, and even where interstate traffic is involved the control should be by co-operation of the regulatory bodies of the two or more states interested.

American Association News

Introducing Traction Tom

By Labert St. Clair

Director of Advertising, Committee of One Hundred, A.E.R.A.

TRACTION TOM, a new figure in the electric railway field, is being introduced to the industry by the advertising section of the American Electric Railway Association.

Tom has been given a permanent assignment as the representative of all the electric railway employees in the United States to tell the public something about the traction business in the language of the worker behind the guns. He is to appear on posters, in newspaper ads and other channels.

Samples of posters and newspaper cuts already have been sent to all electric railway companies in the country and manufacturer members of the association. They are ready for distribution. A series of newspaper advertisements is being prepared and will be ready within another week.

Tom is the outgrowth of the poster series called "The Men Behind the Electric Railways," recently distributed by the Committee on Co-operation of Manufacturers. That series proved a popular one, some 200 electric railway companies using it, and reports from them indicate that the public read the posters with interest.

In creating Traction Tom an effort has been made to reflect in his face the spirit of courtesy and enthusiasm which is manifest in progressive electric railway employees throughout the country. It is the conviction of the manufacturers' and the publicity committees that Tom's friendly countenance will carry the real message of the electric railways to the riding public and arouse a keener appreciation of the work that the employees are doing in providing safe, comfortable rides for customers.

Tom's introductory remarks, through *Truth*, a clip-sheet issued by the association, epitomize fairly well his purpose. This is what he says:

"I am Traction Tom. I speak for the 500,000 workers in the United States who draw pay, directly or indirectly, from the electric railways.

"We are a very important part of a great industry that is on the come-back road after some hard knocks.

"We are out to boost the electric railways because they are necessary and because without them our jobs just wouldn't be."

It is hoped that in addition to using the standard material which is prepared by the association's advertising section companies will localize Tom to the fullest possible extent. The best good can be obtained from using him by tying him up locally with current events through his comments on them. Tom really should be made a sort of browsing salesman for local electric railways, and the closer he gets to home with his comments the more valuable he will be.

Here's a sample of one of the newspaper ads now being offered by the advertising section, which shows the chatty sort of text that Tom's face seems to fit:

"I Liked That City—The Cars Wait for You"

"I was down in Memphis, recently, and an old friend of mine told me how her mother always swore by a certain big city in the eastern part of the United States.

"For a long time the old lady never mentioned any specific reason for liking the town, and, finally, after she had bragged and bragged about the place, my friend asked why she liked it.

"'Well,' she explained, 'the street cars always wait for you there.'

"Probably the old lady, like many persons, thought many electric car men run away from customers purposely.

"They don't. In fact, if they did and the boss found it out, their jobs wouldn't be worth much. Sometimes my buddies overlook folks and pull away from them. But none of them ever does it purposely.

"If you ever think they do, write the boss. He and the rest of us will appreciate it.

"But please make all the haste you can. We men have to keep a certain schedule with our cars just like steam railroad engineers, you know. Traction Tom."

Full details regarding Traction Tom and how to use him will be supplied by the association if you will just drop it a line.

Heavy Traction

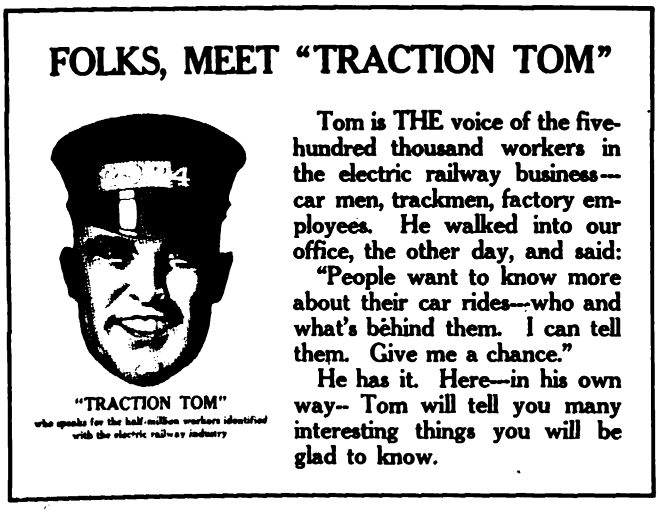
A MEETING of the heavy traction committee of the Engineering Association was held at New York on April 15. The sub-committee on revision of the bibliography on heavy electric traction, H. F. Brown, chairman, reported that it had been decided that the bibliography should be held to a selected list of publications. Professor Warner, who is in charge of the revision, has done some considerable preliminary work. A proposed classification of the index was presented for consideration of the committee, and a number of changes were suggested. The entire matter was referred back to the sub-committee with instructions to proceed along the line of its report.

Mr. Armstrong was appointed chairman of a sub-committee on branch-line electrification, to obtain data on self-propelled cars, Diesel-electric, gas-electric, and battery locomotives.

A report of the sub-committee appointed to study train operation, with particular reference to articulated trains, was presented by its chairman, Mr. Sinclair. A drawing has been prepared showing the various articulated trains built or proposed.

Mr. Daus, chairman of the sub-committee to study methods of connection between cars, has prepared a questionnaire on methods of coupling, including air and electric circuits. It is the intention to send out this questionnaire to all railways operating trains.

Members present were J. C. Davidson, chairman; A. H. Armstrong, H. F. Brown, Morris Buck, A. H. Candee representing H. W. Cope, A. H. Daus, J. H. Davis, J. V. B. Duer, Norman Litchfield, J. O. Madison, J. J. Sinclair, L. S. Wells, C. R. Harte, sponsor, and G. C. Hecker of association headquarters.



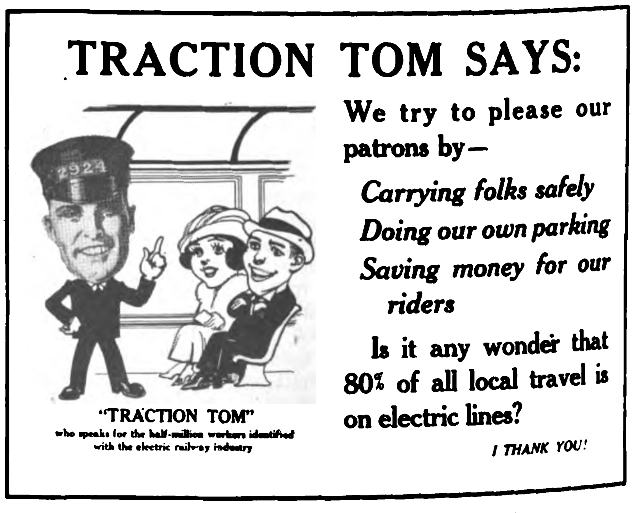
FOLKS, MEET "TRACTION TOM"

"TRACTION TOM"
who speaks for the half-million workers identified with the electric railway industry

Tom is THE voice of the five-hundred thousand workers in the electric railway business—car men, trackmen, factory employees. He walked into our office, the other day, and said:

"People want to know more about their car rides—who and what's behind them. I can tell them. Give me a chance."

He has it. Here—in his own way-- Tom will tell you many interesting things you will be glad to know.



TRACTION TOM SAYS:

"TRACTION TOM"
who speaks for the half-million workers identified with the electric railway industry

We try to please our patrons by—

Carrying folks safely
Doing our own parking
Saving money for our riders

Is it any wonder that 80% of all local travel is on electric lines?

I THANK YOU!

Two Samples of the "Traction Tom" Series of Posters Put Out by the Advertising Section of the A.E.R.A.

The News of the Industry

Engineers Report at Detroit

Underground Lines Suggested for Use Downtown with Super-Highway System of Suburban Feeders

Daniel L. Turner, consulting engineer, and John P. Hallihan, engineer in charge for the Rapid Transit Commission of Detroit, recommend underground lines in downtown Detroit and surface lines on private right-of-way in suburban districts. This plan is suggested as the backbone of the future transit system. Based on the engineers' report the commission has also recommended a system of 217 miles of super-highways with a width of 204 ft. The report of the engineers containing these recommendations has just been made public. It follows a report on financing rapid transit, which was published in this paper Dec. 8, 1923.

The present report submitted by the engineers relates to the district outside the built-up portion, referred to as that part between the 6-mile and 15-mile circles. The subway system for the city of Detroit will be covered in a report to be issued later. The suggestion for the proposed super-highway system has been discussed and considered with the officials of the communities that it would affect directly.

The engineers point out that Detroit is now being strangled because of lack of streets. It is believed by the engineers that by 1950 Detroit will probably extend out 11 miles from the present center. The proposed super-highway system is designed to serve an area more than three times that of the present city and that area is almost entirely outside of the Detroit of today. The super-highway district is definitely outlined. In the 204 ft. super-highways there will be a central space of 84 ft. for the exclusive use of rapid transit lines on rails. Tunnels underneath the rapid transit tracks and the express motor lane will give access to either side of the street for pedestrians as well as motor vehicles. The rapid transit and express motor services will not be subjected to any crossing interferences.

At a rapid transit station, the rapid transit and motor express lanes would be elevated to permit tunnels for intersecting traffic. The upgrade would aid in retarding rapid transit cars as they approached a station, while the down grade on the other side would aid in accelerating the cars. Passengers alighting from rapid transit cars would descend a stairway at the station, pass to the tunnels underneath and reach the side of the highway. Rapid transit lines would dip under or cross over the intersecting line. As such lines approached the built-up sections of the city they would dip underground and thus reach the heart of the city.

A plan is being drawn up by P. J. M. Hally, counsel for the commission, and a bill is to be submitted to the Legislature which would create a transportation district and permit the levying of an annual tax of one half mill, which would provide from $1,250,000 to $1,500,000 annually for the purpose of acquiring the right-of-way for the super-highways.

The super-highway, it is claimed, will also supply rapid transit on rails in the future at the cheapest cost to the community, even including the cost of the right-of-way necessary. The cost of constructing the permanent way of a four-track rapid transit line on the super-highway, but exclusive of real estate and equipment, it is estimated, will be about $1,100,000 a mile, whereas a subway would cost about $5,500,000 a mile. At the start, the report states, only two-track lines will be required. They will suffice until the city has spread out beyond the 10-mile limit.

The report further states that inside the city, where existing streets control, only underground or elevated lines can be considered, with the underground line preferable.

Fifty Buses for Cleveland

A fleet of not less than fifty buses is to be operated by the Cleveland Railway to supplement electric railway service in Cleveland. Announcement to this effect was made by John J. Stanley, president, on April 16, when the company formally asked the Ohio State Public Utilities Commission for a certificate of convenience and necessity, as required by the Ohio state law.

The application of the railway followed dismissal by the commission of the request of the Cleveland People's Motor Bus Company for similar permission. A hearing on the Cleveland Railway's application has been set for May 29.

The buses will be of the double-deck type. They will be used over five routes, part of which will parallel railway lines. The rate of fare will be at least 10 cents, according to the company, and may be double the present railway fare in Cleveland, which is 6 cents cash, with a 1-cent charge for transfer.

"It is the idea of the company to attract to the motor bus automobile riders and not street car riders," said Joseph H. Alexander, vice-president of the company. "We hope to induce people to ride the buses instead of driving their own automobiles to business. Our bus plans call for quality service."

The routes will run from the suburbs of Lakewood, East Cleveland, and Cleveland Heights, along boulevards and some along streets now covered by street car tracks. They will all end at the Public Square.

Legislature in Review

Some Outstanding Accomplishments of New York Body Reviewed Briefly —Tax Committee Bill Killed

The Legislature of New York State, in annual session adjourned April 10, will be remembered for having passed a 25 per cent income tax reduction law good for 1924 only, for having enacted a home rule enabling act for cities made mandatory upon it by constitutional amendment, for the passing of a compromise transit bill affecting transportation in the city of New York, for having committed the state to a policy of the ultimate expenditure of $300,000,000 for grade crossing elimination and $100,000,000 for the construction of new buildings and improvements by the issue of bonds, if constitutional amendments passed at this session are approved at a subsequent legislative session and receive the favorable vote of the people, and for having consistently refused to adopt a system of public utility regulation and plan of municipal operation of as radical a nature as was ever presented to a legislative body.

The general amendments to the transportation corporations law intended to simplify the procedure of forming utility corporations and functioning under the statute, introduced during the closing days of the session by Senator Fearon, failed to be reported for consideration, but it was anticipated that this subject would go over for another year and the bill was introduced to show progress of the committee and get something tangible before the public so that the interests affected would have opportunity to study the proposed law.

HOME RULE ACT PASSED

The home rule enabling act was finally passed as a new consolidated law instead of being made a special act. It will give to municipalities a certain degree of regulation over public utilities, and the fear that the courts might interpret this power so as to give New York City power to intervene in transit matters is responsible in no small degree for the final compromise reached in relation to this subject.

Among the bills in the Governor's hands as thirty-day bills may be mentioned:

The Garnjost bill (Assembly Print No. 1650), amending Section 53-a Public Service Commission law by providing for the electrification of railroads in the cities of Yonkers and Mount Vernon.

The McGinnies bill (Assembly Print No. 1863), making an addition appropriation of $3,500,000 toward the construction of the New York-New Jersey vehicular tunnel.

The Davison bill (Assembly Print No. 2241), adding new Section 26-b general corporation law, by providing preference in payment of judgments recovered in actions for torts against public service corporations shall be given in liquidation of affairs of the corporation.

The Russell bill (Senate Print No. 546), extending for one year from date of passage of bill the operation of the street railway line of the Nassau Electric Railroad known as the Park Avenue line without exchanging transfers.

The Fearon bill (Senate Print No. 1280), amending the railroad law and stock corporation law, authorizing a domestic railroad corporation to increase or reduce its capital or capital stock pursuant to Section 37 stock corporation law.

The Davison bill (Assembly Print No. 2304), amending the tax law, in relation to the payment and distribution of corporation franchise taxes.

The Legislature amended the workmen's compensation law reducing the non-compensated period after accident from seventeen to seven days, increasing the death benefits for accidental death and increasing the number of payments during the healing period after injury.

Noticeable among the recommendations of the Governor which was killed was the proposition to create a disinterested commission of experts to study the entire tax system of the state, to devise ways and means of relieving public utility corporations from unequal assessments and to suggest a plan which would provide a staple source of revenue for the support of the schools. As a substitute for this, the Davenport-Sheridan tax committee was continued, with an additional appropriation of $25,000.

I.R.T. Will Reduce Wages Five per Cent

Announcement was made by Frank Hedley, president of the Interborough Rapid Transit Company, New York, N. Y., that because of increased expenses in operation and loss of passenger revenue a 5 per cent reduction in wages is proposed for July 1. This reduction would bring the wage scale back to that in operation two years ago. At that time the men accepted a decrease of 10 per cent. Last June the wages were increased 5 per cent. According to Mr. Hedley this increase of last June amounted to an increase in operating expenses of about $1,250,000 for the year. Notification of the wage reduction was made in a circular to the men which said that the company could not buy its supplies cheaper, could not get further reduction in rental and could not borrow more money while its business was in the present condition. No statement has been made through the brotherhood of the Interborough employees.

Final Hearing on Fares in Connecticut on June 2

Another snag in the fare settlement in Connecticut was struck at the resumption of the hearing before the State Public Utilities Commission in Hartford on April 14. At the conclusion of the hearing officials of the Connecticut Company were ordered to report the details of operation expenses to the commission not later than May 12. A final hearing will be held at Hartford on June 2 after an allowance of three weeks for those opposing the fare increase to study the data.

Meanwhile fares will remain as at present, with tokens at the rate of three for 25 cents for all lines in the State except those in Bridgeport. There the rate of two rides for 15 cents will be continued under commission order until the entire question of fares for the State has been decided. Attorney Watrous for the Connecticut Company wanted the fare in Bridgeport to be raised at once to three rides for 25 cents.

Edward G. Buckland, vice-president of the New York, New Haven & Hartford Railroad, which owns $40,000,000 of stock of the Connecticut Company, asked that the Connecticut Company be permitted to earn a fair return upon the value of its property devoted to the service of the public. The earnings of the Connecticut Company are given elsewhere in this issue.

Capital Traction Employees Receive a Two-Cent Increase

The board of arbitration, by a vote of two to one, has granted the employees of the Capital Traction Company, Washington, D. C., an increase of 2 cents an hour. William Knowles Cooper, chairman of the board, and Stanton C. Peelle, the company's representative, voted for the increase, while Representative Tague of Massachusetts, for the men, dissented on the ground that the advance was not sufficient. The men had petitioned for a flat increase to 70 cents an hour. The agreement fixes the following schedule for the Capital Traction: First three months, 52 cents an hour; next nine months, 56; thereafter, 58 cents. At the present time both the employees of the Washington Railway & Electric Company and the Capital Traction Company are receiving 50, 52, 54 and 56 cents. It was roughly estimated that the increase would add between $65,000 and $70,000 a year to the company's payroll expenses. No action has been taken yet on the scale of the Washington Railway & Electric Company's employees.

Two Bus Ordinances Offered in New Orleans

Commissioner Paul H. Maloney of the Department of Public Utilities of the city of New Orleans, La., has offered two ordinances to the Commission Council calling upon the New Orleans Public Service, Inc., to operate a bus service on the streets not now served by railway lines in the upper and lower sections of the city. This is in keeping with the recommendations contained in the Beeler report, which has not as yet been adopted by the Commission Council. The delays incident have occasioned the residents of that area, a thinly-settled portion of the city, great discomfort and inconvenience to reach the street cars.

The officials of the company are reported to have expressed themselves as ready and willing to meet the requirements of the city, in so far as single-deck buses are concerned, but allege that the spreading branches of the big oak trees, in the outlying districts, may make it impractical and hazardous to use double-deck buses on the routes. They assert that the buses will be in readiness for operation within sixty or ninety days.

Ninety-Cent Rate Asked

This Is Maximum Rate Requested in New Cleveland Contract Dating from May 1

Motormen and conductors of the Cleveland Railway, all of whom are affiliated with the Amalgamated Association, have filed a formal demand for an increased wage.

The men are now getting 55 cents an hour for the first three months' service, 57 cents an hour for the next nine months, and 60 cents an hour after the first year. They are asking 85, 87 and 90 cents an hour. The highest previous wage scale paid by the company in 1921 was 70, 72 and 75 cents an hour.

In addition to the wage increase the men also make the following demands:

Workday in the week as near as possible straight eight hours.

Pay on regular runs based on eight hours, minimum.

Time and a half over nine hours.

Sixty per cent of runs laid out inside nine hours.

Thirty per cent inside twelve and a half.

Ten per cent inside fourteen.

Fifteen minutes' extra pay for twelve-and-a-half-hour completion.

Thirty minutes' extra pay for thirteen hour completion.

Forty-five minutes' extra pay for thirteen-and-a-half-hour completion.

Hour extra pay for fourteen-hour completion. (Many runs are now divided between morning and evening rush travel.)

Union to have voice in altering schedules to shorten runs and hours.

Eight-hour runs and time and a half on all Sundays and holidays.

Eight-hour runs at ten-hour pay at night.

Regular crews to get time and a half for extra runs.

Six-hour minimum pay for "trippers."

Breaks or layoffs in regular runs to be paid for as platform time up to one hour.

Allowances for reporting, whether or not assigned to duty.

Thirty minutes' extra pay for making out each accident report.

One day off in eight with pay.

Two weeks' vacation each year with pay.

Five cents an hour extra for instructing new crews.

Company to furnish change for conductors.

Passengers who report trainmen to be compelled to make deposit to reimburse him for time lost in investigation if charges against him are not sustained.

Heating of all cars from Oct. 15 to April 15, instead of from Nov. 1 to April 1, as at present.

Ten minutes' layover at end of every trip and comfort stations at end of every line.

Trainmen under suspension to be relieved of punishment if asked to report during time of suspension.

Pay for the ten minutes time for reporting required of all crews before starting day's work.

John J. Stanley, president of the company, said to grant the demands would increase the payroll $5,000,000 a year and necessitate a 10-cent fare.

The present agreement between the company and the union calls for arbitration of the men's demands. Apparently because the men did not get all they asked for a year ago, they are also asking to have the board of arbitration changed from a three-men body to one composed of five men, two to be named by the company, two by the union and the fifth to be appointed by the Governor of the State in case the four cannot agree. Under the present plan the umpire is appointed by the local federal judge.

The present agreement expires May 1. A prolonged dispute appears likely over the question of changing the composition of the board of arbitrators from three to five members.

No Opposition to Buses in Rensselaer

An informal hearing was held at the City Hall in the city of Rensselaer April 15 at which General Manager Murphy of the United Traction Company appeared and explained the route on which the United Traction proposed to substitute bus transportation for trolley service. The company proposes to abandon railway service on the Broadway-Akin Avenue line in that city. This hearing was called by the Common Council to get an idea of sentiment before the introduction of any ordinance.

No opposition developed at the hearing to buses being substituted for trolley service.

The Capitol District Transportation Company, Inc., Albany, N. Y., was recently formed to operate stage or omnibus routes in Albany, Rensselaer and Saratoga counties. It has a capital of $100,000. The directors and subscribers are Leonor F. Loree, New York City; William H. Williams, Lyon Mountain, N. Y., and Harry B. Weatherwax, Albany, N. Y. The attorney is John E. MacLean, 598 Broadway, Albany, N. Y.

This is a subsidiary of the United Traction Company formed to make application for the operation of buses and trackless trolleys in Rensselaer and Cohoes. The attorney is attorney for the United Traction Company and the Delaware & Hudson Railroad.

Detroit Will Try Trackless Trolley

The Department of Street Railways, Detroit, Mich., will carry on experiments with one of the latest models of trackless trolleys which is expected to arrive in the city shortly.

The type of trackless trolley which is to be tried out is of large capacity, carrying approximately as many passengers as one of the one-man cars now in use on certain lines in Detroit. It has been announced that several of these cars will be purchased if the trials prove such equipment to be adaptable to Detroit's needs and conditions. They will be for use in the outlying districts.

Subsidiary Bus Company Formed

A certificate of public convenience was granted recently to the Valley Motor Transportation Company of East Liverpool and Steubenville by the State Utilities Commission at Columbus, Ohio. The Valley Motor Transportation Company is a subsidiary of the Steubenville, East Liverpool & Beaver Valley Traction Company. The commission extends to the company the right to establish and operate bus lines in East Liverpool and Steubenville.

The company at the present time is maintaining bus service on the old River Road line between the Diamond and the Mulberry Street junction and also along the Lincoln Highway between Pleasant Heights and Stop 55. A bus is also operating on the La Belle View line in Steubenville. The company began the operation of buses on the Pleasant Heights and River Road lines immediately upon settlement of the car strike about a year ago, when it took over cars which had been purchased by the Ceramic City Motor Car Company.

Washington Fare Measure to Be Included in Appropriation Bill

Although hearings have not been concluded by the Senate District of Columbia committee on the bill seeking to force a 5-cent fare in Washington, Senator McKellar, author of the measure, has practically abandoned his effort to secure action on a separate measure and has served notice that he will make an attempt to have the proposal attached to the District of Columbia appropriation bill as a rider. The appropriation bill is expected to reach the Senate about May 1.

The McKellar 5-cent fare bill is opposed by the Capital Traction Company, the Washington Railway & Electric Company and the Public Utilities Commission of the District.

In testifying before the Senate committee, Senator McKellar took the position that the franchise contracts of the two corporations provide for a 5-cent fare. He says that the return allowed by the Public Utilities Commission is based on excessive value.

Officials of the two companies have shown that the income of both railways had decreased steadily since the war ended. While the Capital Traction Company last year earned 7 per cent, plus, on its fair value as fixed by the Public Utilities Commission, the Washington Railway & Electric Company fell far below this figure. The two corporations combined earned less than 6 per cent on their combined fair values.

The present fare in Washington is 8 cents cash, or six tokens for 40 cents.

Operators Tell About One-Man Cars to Help Dayton

City Attorney J. B. Harshman of Dayton, Ohio, has returned to Dayton from New York City, where he went to inquire into the use of one-man cars. Upon the application of Attorney J. Sprigg McMahon, of the law firm of McMahon, Corwin & Landis, representing the railways in Dayton, the depositions of a number of the electric railway operators in the East were taken. Among those who were examined were C. W. Kellogg of Stone & Webster; C. E. Morgan, Brooklyn; E. M. Walker, Schenectady; John E. Duffy, Syracuse. E. J. Murphy, chief statistician of the American Electric Railway Association, corroborated the testimony of the railway officials. An ordinance intended to prohibit the use of one-man cars in Dayton was passed some time ago, but enforcement of its provisions has been delayed. It is said now that the situation will probably be solved by an arrangement being put into effect under which both one-man and two-man cars will be permitted to operate under a definite arrangement which will fix the hours of use of each class of vehicle.

Jitneys Cease Operation in Houston

In accordance with the terms of an ordinance jitneys ceased operation in Houston on March 31. Prior to that date a petition had been filed by several jitney drivers seeking to enjoin the city from enforcing the ordinance, but the city attorney answered by filing a general demurrer which was sustained by the district judge. The attorneys for the jitney drivers gave notice of an appeal to a higher court, but as yet no date has been set for the hearing.

The Houston Electric Company began its increased service on March 28, and on the morning of April 1 was fully prepared to handle the additional traffic. The company is now operating three 29-passenger Yellow Coach buses in all-day service and six during the rush hours over the route of the former Austin jitney line.

The only changes necessary in the operation of the railway system to care for the jitney riders, and to prevent congestion in the downtown district, was the addition of extra cars, rerouting of three lines in the business section, and the use of street collectors.

Eastern Massachusetts Carries Dash Signs to Attract Business

The Eastern Massachusetts Street Railway, Boston, Mass., has been carrying dash signs on its cars for the purpose of attracting more business to the railway. The posters are 21 in. x 13 in. in blue, red, maroon and green type, carrying such messages as "Park your worries at home," "Travel by trolley," "Snow ahead—store auto and use trolley," "The street car stops near all the shops," "Shop by trolley and keep out of the auto jam," and "Travel by trolley for convenience and economy." The publicity campaign was started just before Christmas. Each of the signs was carried about two weeks, with two signs on each car.

The effect on riding is not known as yet; however, a large number of favorable comments from people in the territory have been received by the company, a fair indication that the dash signs have done some good.

Conferences on Wage Matter Scheduled in East St. Louis

Officials of the East St. Louis & Suburban Railway and its East St. Louis Amalgamated employees will confer regarding a new wage scale to take effect when the present contract expires on May 1. A decision to ask for an increase in wages was reached at a meeting on April 10.

The present wage scale in East St. Louis provides a maximum of 56 cents an hour for suburban men, 54 cents for city men and 58 cents for operators of one-man cars. Men employed three months or less get 45 cents; for the next six months, 48 cents, and at the end of nine months 53 cents. After a year they receive the maximum pay for regulars. Conductors and motormen in St. Louis are paid a maximum of 67 cents an hour.

News Notes

Providence Council Opposed to Fare Increase. — The Common Council of Providence, R. I., recently concurred in a resolution directing the city solicitor to appear before the Public Utilities Commission to oppose any increase in fare for the United Electric Railway until the fare zones are extended to the city line. In the annual report of the company it was intimated that the railway would soon petition for increased fares.

Offices Moved.—The Chicago Surface Lines, Chicago, Ill., is moving some of its offices from the eleventh floor of the Illinois Merchants Bank Building to the fourteenth floor of the newly completed section of the building. After April 14 the executive offices will all be on the fourteenth floor and the address will be 231 South La Salle Street.

Fares Lowered.—The new management of the Hornell Traction Company, Hornell, N. Y., has reduced the fare from 8 cents to 7 cents. Some time ago it was announced that the line would probably discontinue service because of financial difficulties. Later it developed that the bondholders voted to have the interest of the company turned over to Raymond Page and W. C. Whitaker. One of the first things the new management did was to reduce fares in the hope of regaining patronage.

Committee Appointed to Formulate Plan.—Another step in the solution of the Spartanburg traction muddle was taken on April 9 with the appointment by the Chamber of Commerce of a committee of prominent unbiased citizens to study the situation and advance a plan that would be acceptable both to the city and the South Carolina Gas & Electric Company. The Chamber of Commerce officials believe that the present inadequate transportation facilities are a distinct disadvantage to the growth of the city.

Bus Line to Replace Railway.—Announcement has been made that the Public Service Railway, Newark, N. J., plans to tear up its tracks in Scotland Road, south of Central Avenue, Orange, and operate a bus line between Morris Avenue and the carhouse at Washington and Dodd Streets, that city. It is expected track removal work will start as soon as definite assurance is received from the county that the freeholders are going to pave and take over the road between Morris Street and Central Avenue. The bus line is to be started within the next month.

Debut of Surface Service Magazine.—Because the company feels that there has been developed a widespread and genuine interest in the activities of the Chicago Surface Lines it has started the publishing of a company pamphlet called "Surface Service Magazine," which will aim each month to discuss public questions and will disseminate news and comment of special local interest. The publication will broadcast the work of all departmental units in the belief that it will help toward making the Chicago Surface Lines a model for the transportation world. The première contained some twenty pages, including stories on "Measuring Power Consumption," "Strong for Accident Prevention," and "Caring for the Eyes." In addition the readers were given a few laughs in the selection of some real jokes.

Fares Increased in Texas Towns.—The City Commission of Denison, Tex., has granted the application of the Texas Electric Railway, which operates local service in Denison, for authority to increase the fare charged in Denison from 5 cents to 7 cents. The application set forth that the company found it impossible to maintain efficient service with a 5-cent fare. The company will sell four fare tokens for 25 cents and will grant one-half fare for all students where books of tickets are purchased. A similar increase was granted by the City Commission at Sherman, which is also served by the Texas Electric Railway.

Six-Cent Fare Extended.—The City Council of Richmond, Va., has again extended the 6-cent fare privilege to the Virginia Railway & Power Company for its Richmond lines. Ordway Puller, chairman of the Council committee on streets, promised action on the franchise of the Virginia Railway & Power Company within the next sixty days. The franchise requested by the company would combine all of its various contracts with the city, expiring at various times during the next ten years, under one agreement. Mr. Puller said he would at a later date issue a detailed statement explaining why there has been delay.

Baseball and Transit Guide in One.—Dates for New York City baseball games are included in a pamphlet recently issued by the Interborough Rapid Transit Company, New York. The pamphlet, called "Ride on the Open Air Elevated," contains a map which is designed primarily as a guide for patrons on elevated lines. Some valuable pointers on both local and express service are included as special features of the "L" service. When the reader wearies of traveling from Brooklyn to the Yankee Stadium or the Polo Grounds he can look over the schedule of the Yankees and Giants "at home."

Co-operation Brings Better Traffic Results.—Co-operating with the police department and practicing double-berthing instead of single-berthing at the corners, the Grand Rapids Railway, Grand Rapids, Mich., has succeeded in cutting the rush-hour time through the business section of the city from thirteen to eight minutes, according to L. J. DeLamarter, vice-president and general manager. Loading platforms at several corners have greatly aided in the time saving, particularly since the platforms have been lengthened to accommodate two cars. The double-berthing enables two cars to move forward at the same time. As a further help police have been permitted to wave on cars against the traffic lights when such move will expedite keeping the street clear. This is practiced especially when cars turn on to the avenue from side streets.

Rate Case Closed.—The rate case of the International Railway, Buffalo, N. Y., before the Public Service Commission on the application of the city authorities of Buffalo for a return to the 5-cent fare, has been closed and the evidence is now being considered by the Public Utilities Commission. At the final hearing before the commission counsel for the International Railway asked dismissal of the city's application and approval of the company's request for an 8-cent city fare. A 7-cent fare with four tokens for 25 cents is now being charged in Buffalo.

Commission to Settle Dispute.—The State Corporation Commission of Virginia has been asked to settle the dispute between the city of Norfolk and the Virginia Railway & Power Company over lines operating in Edgewater, a suburb of Norfolk. The city contends that the line is essential, but the company claims that it cannot be made to pay and should be abandoned. About a year ago the commission was asked to settle the controversy, and recommended that an attempt to reroute the line be made. For the last ten or twelve months both parties have discussed the matter but without reaching any agreement satisfactory to both, and the result is that the commission has been asked to take a hand again.

Wages to Be Arbitrated. — Having failed among themselves to reach an agreement on the wage question, the Trenton & Mercer County Traction Corporation, Trenton, N. J., and its employees have submitted the wage matter to arbitration. Albert S. Richey, Worcester, Mass., has been selected to represent the company, while James H. Vahey will appear for the men. Messrs. Richey and Vahey will choose a third arbitrator. The agreement between the company and men expired on April 1. As a result of conferences issues covering most of the working conditions have been adjusted, but the wage question remains unsettled.

Given a One-Year Permit.—The Atlantic Coast Transportation Company has been offered by the Asbury Park Board of Commissioners a one-year permit to operate buses at that place. To secure the permit the transportation company must agree to a 7-cent fare with transfers, conduct a ten-minute schedule and agree to permit the city to sanction the type of bus, which must be uniform. The Atlantic Coast Transportation Company, which is operated by the Atlantic Coast Transit Company, is capitalized at $100,000.

B.-M. T. Publishes Map for Guidance.—A new map and guide to all Brooklyn-Manhattan Transit lines has been published by the Brooklyn-Manhattan Transit Corporation. It was distributed for the first time at the opening night of the Brooklyn Industrial Exposition on April 5 to visitors at the B.-M. T. booth. The map and guide will be placed conspicuously in all the company's cars. The map is folded so as to be convenient to carry in pockets or handbags. The subway lines are printed in black and the elevated lines in red. On the reverse side of the map is a complete guide with the names of the stations and hours of service.

Financial and Corporate

St. Louis Net Higher

Increase of $296,653 for 1923 Shown Over the Result for 1922—Congestion Becoming a Problem

Net income of the United Railways, St. Louis, Mo., for the year 1923 increased $296,653 over the year 1922. For 1923 the net was $809,745. For 1922 the net was $513,092. Gross operating revenue increased $489,889, from the sum of $19,963,555 in 1922 to $20,453,445 in 1923. It is explained in the printed report of the company for the year that all of the underlying bonds, aggregating $6,100,000, matured Oct. 1, 1923, and that the St. Louis & Suburban Railway general mortgage bonds matured April 1, 1923. It is further explained that the St. Louis Transit Company bonds mature Oct. 1, 1924, and the default in payment of the underlying bonds created a default in the United Railways general mortgage bonds due July 1, 1934. No interest has been paid on any of the bonds since Oct. 1, 1923, but interest has been accrued on the books to Dec. 31, 1923, at the rates provided by the mortgages or extension agreements.

No payments were made during the year on the liability of $2,396,321 for mill tax due the city of St. Louis, this amount being the balance of judgment obtained by the city against the company for mill tax to Dec. 31, 1918. The interest on this judgment, however, has been accrued on the books to Dec. 31, 1923, and the current mill tax has been paid regularly.

Provision for depreciation, renewals, etc., aggregated $1,500,000 for the year 1923, this amount having been fixed by a ruling of the Missouri Public Service Commission. Charges against the depreciation reserve during the year aggregated $788,998 and consisted principally of reconstruction of track and roadway, and retired equipment.

The surplus of the company as of Dec. 31, 1923, stood at $4,275,573, made up of a balance of $3,377,773 and $897,800 of additions during the year. The balance sheet of the company shows among the assets $5,341,150 of United States government bonds and treasury notes.

Rolla Wells, the receiver, points out that the total taxes and street paving costs for the year 1923 amounted to $2,287,048, or 0.781 cents per revenue passenger. In his review of the affairs of the company the receiver explains quite fully the improvements carried out. Thus during the year 26.82 miles of track was reconstructed or renewed, fifty new cars were built, 113 cars were remodeled, shops and shop equipment were improved and the power supply augmented.

Mr. Wells says that the difficulty of operations in so-called "congested districts" has become more acute. He says that both the efficiency of the service and the expense of the company have been affected by allowing automobiles to be parked indefinitely in those districts, the lack of proper regulation of so-called service cars, the increasing number of passenger automobiles and freight trucks, and especially the permits granted by the Board of Public Service to buses to operate over certain of the heaviest lines of the street car traffic. Thus he says that the number of reveue passengers in 1923 (although seriously falling off in the latter part of the year) was 2.31 per cent greater than in 1922, and the largest in any year in the history of the company. On the other hand, for the purpose of improving the service, the car-miles increased 3.22 per cent, but due to the congestion mentioned the car-hours increased 4.35 per cent and the average miles per hour decreased 1 per cent.

During 1923 the work of equipping passenger cars with Economy watt-hour meters was completed. This work was begun in 1922. Mr Wells says that the results have been very gratifying. The total cost of installation (including equipment for testing and maintenance) was $105,944. The saving in power consumption per car-mile measured at the cars was 8.6 per cent and at the power house primary switchboards 5.8 per cent. On the latter basis the gross saving in cost of power was approximately $112,690. Liberally deducting a depreciating charge of 10 per cent on equipment and 7 per cent interest thereon and all costs for operating meters, maintenance, wages of instructors, inspectors, and clerks, the net saving for the year was approximately $78,293.

STATEMENT OF EARNINGS OF UNITED RAILWAYS, ST. LOUIS

	1923	1922
Revenue from transportation	$20,220,765	$19,740,118
Revenue from other railway operations	232,679	223,437
Gross operating revenue	$20,453,445	$19,963,555
Current operating expense and depreciation	$15,123,183	$14,895,508
Taxes	1,832,602	1,845,722
Total operating expense, depreciation and taxes	$16,955,785	$16,741,231
Income from operation	$3,497,659	$3,222,324
Non-operating income	225,700	202,830
Gross income	$3,723,359	$3,425,155
Interest and miscellaneous charges	2,913,614	2,912,063
Net income for the year	$809,745	$513,092

TRAFFIC STATISTICS OF UNITED RAILWAYS, ST. LOUIS

	1923	1922
Revenue passengers	292,671,781	286,076,475
Transfer passengers	155,343,193	152,261,868
Total passengers	448,014,974	438,338,343
Percentage of revenue passengers using transfers	53.08	53.22
Average fare per passenger (including transfers)	4.50c	4.49c
Average fare per revenue passenger	6.89c	6.89c
Passenger car-miles	45,652,714	44,229,300
Revenue passengers per car-mile	6.41	6.47
Total passengers per car-mile	9.81	9.91

With respect to the valuation, Mr. Wells says that on June 4, 1923, after more than four years of work on the valuation of the property in charge of the receiver, the Missouri Public Service Commission handed down its decision and order, fixing as of Jan. 1, 1919, the value of the property of the United Railways (including property of the Florissant Construction, Real Estate & Investment Company) at $52,838,110, and that of the Missouri Electric Railroad at $781,949. Petitions by both the city and the company for a rehearing are still pending before the courts, but developments since Mr. Wells made his report appear to indicate a settlement out of court.

Tidewater Line at Birmingham Sold Under Foreclosure

Sale of the Tidewater line to the National Power & Light Company for $750,000 and the assumption of bonds and debts amounting to $1,675,000 was made by J. S. Pevear, special master, on April 15. The sale followed the negotiation of an agreement between representatives of the company and the members of the City Commission at Birmingham, Ala., permitting the rerouting of the line with a considerable amount of track abandonment. The purchase is presaged on the agreement being carried into effect by the city by April 19. The property was bid in for the National Power & Light Company by F. B. Odlum, acting for L. B. Hatch, who purchased the properties of the Birmingham Railway, Light & Power Company for the same concern.

Elimination of seventy-two railroad crossings at grade was effected by the track abandonment consented to by the members of the City Commission at the conferences. Changes agreed to by the City Commission, it is stated, will permit the Tidewater line to be made an integral part of the railway system and will enable the company to operate the portions of the line retained under the agreement on a self-sustaining and perhaps a profitable basis.

Operation of the Tidewater line has been in the hands of the Birmingham Railway, Light & Power Company and later in the hands of the receivers for several years. The line, according to officials of the company, has just about broken even on operation expenses, but has lost about $40,000 a year in depreciation of tracks and equipment. Lee C. Bradley and Mr. Pevear, co-receivers, stated to city officials that unless an agreement could be reached that would enable the reorganized company to take over and operate the useful portions of the line on a self-sustaining basis the entire line would have to be junked. The City Commission originally declined to consent to the changes asked, which are in the main the changes which were consented to in the agreement just adopted. Commissioner William L. Harrison wrote a letter offering the line to Henry Ford, but was later advised that Mr. Ford was not interested. The agreement was reached when the company representatives met the city's terms on through service, additional paving, the $75,000 payment for franchise revisions and track changes, and consented to retain certain trackage on the western end of the line which had originally been included in the plan for abandonment.

Stockholders Seek Dissolution of Northumberland Property

Stockholders of the Sunbury, Lewisburg & Milton Railway, Sunbury, Pa., have voted to petition the court for a decree of dissolution of their corporation. With this action consummated, the property, which consists of a railway between the Sixth Street Junction, in Northumberland, of the Sunbury & Northumberland Street Railway and a point at the western end of the classification yards of the Pennsylvania Railroad, also in Northumberland, will be turned over to a trustee for sale. This line has been operated under the same management as the Sunbury and Selinsgrove lines.

The question of providing transportation for about 4,000 Pennsylvania Railroad employees, between the west end of the yards and the trolley junction, has not yet been solved, although a proposal has been made for establishing bus service between the two points.

U. S. Supreme Court Acts in Clark Case

The United States Supreme Court has declined to review the decision of the Court of Appeals of Franklin County, Ohio, which awarded a verdict to Augusta M. Slaymaker and the Columbus Railway, Power & Light Company against E. W. Clark & Company, and others. Without comment, the Supreme Court on April 14 denied a petition for certiorari which would have brought this case on appeal before it.

Deficit in Honolulu in 1923

The Honolulu Rapid Transit Company had a deficit in 1923 of $33,585. The total revenue from all sources in 1923 was $988,928, compared with $989,521 in 1922. Operating expenses in 1923 were $618,708 as compared with $602,757 in 1922. Passengers carried showed an increase of 5½ per cent over 1921 and an increase of 2 per cent over 1922. The report of the company for the year refers to the bus service started in the Kalihi district on Aug. 16, 1923. From that period up to Dec. 31, 1923, operations resulted in a deficit of $2,038. The improvements and extensions carried out during the past year under the program laid out in 1922 for the expenditure of $500,000 included track work, power installation, construction of six new cars and other miscellaneous improvements and additions.

President Castle said that the year 1923 had been a disappointing one in many respects. With the acceptance of the new franchise in February, 1922, the company was faced with the need of extensive and immediate improvements to its system. Already more than $550,000 had been expended on improvements to track and equipment, new capital expenditure which has been financed in part by a stock issue of $500,000. All of this work had not brought in corresponding increase in revenue. The present rate of return could not be maintained on a 5-cent fare upon present patronage. The results of operation in 1923 compared with 1922 are shown in the accompanying table.

	1923	1922
Total revenue from transportation	$978,433	$973,129
Total revenue from other railway operations	10,495	16,392
Gross revenue from operations	$988,928	$989,521
Total operating expenses	618,708	602,757
Net revenue from operations	$370,220	$386,764
Total deductions	403,805	351,216
Surplus	*$33,585	$35,548

*Deficit

Net Income of Connecticut Company Smaller in 1923

The net income of the Connecticut Company, New Haven, for the year 1923 was $1,025,247. This is a decrease of $285,168 over 1922. Figures to this effect are contained in the statement of the affairs of the New York, New Haven & Hartford Railroad for the year ended Dec. 31, 1923. That company owns the entire $40,000,000 of capital stock of the Connecticut Company and $1,000,000 of debentures and $4,568,916 of the company's notes. This stock is in the hands of federal trustees, who under decree of the federal court shall exercise their best efforts to complete the sale of shares before April 1, 1925.

In commenting on the affairs of the Connecticut Company E. J. Pearson, president of the New York, New Haven & Hartford Railroad, says that while there has been a constantly increasing patronage of the cars in Connecticut, the percentage of increase in passengers has not been equal to the percentage of the reduction in the rate of fare made effective April 1, 1923. Mr. Pearson explains that it was necessary on June 1 to make effective an increase in rates of pay to all classes of labor, and the increased payrolls together with a decreased gross revenue resulted in a decrease in net for the year, the decrease becoming greater as the winter period approached. It was, therefore, necessary to announce an increase in the rate, effective Feb. 10, 1924, to three tokens for 25 cents, referred to previously in the ELECTRIC RAILWAY JOURNAL. The operating ratio in 1923 was 79.32 per cent, an increase of 2.11 per cent over 1922.

INCOME ACCOUNT OF THE CONNECTICUT COMPANY

	1923	1922
Total operating revenues	$14,717,233	$14,477,611
Total operating expenses	11,673,454	11,177,594
Net operating revenue	$3,043,779	$3,300,017
Tax accruals	576,672	558,808
Operating income	$2,467,106	$2,741,209
Non-operating income	62,618	44,831
Gross income	$2,529,724	$2,786,040
Deductions from gross income	1,504,477	1,475,625
Net income	$1,025,247	$1,310,415

Franchise and Financial Details Paramount in St. Louis

The directors of the United Railways, St. Louis, on April 8 ratified the appointment of an enlarged reorganization committee which will take up immediately the problem of refinancing the local railway, now in the hands of Receiver Rolla Wells. The new body will begin where the old committee of three members left off.

The head of that committee was Frank O. Watts, president of the First National Bank, St. Louis. He will be chairman of the new committee which is to have five members. Others on the new committee are to be J. K. Newman, president Newman, Saunders & Company, New York; A. L. Shapleigh, president of the United Railways Company (both members of the old committee); William P. Gest, president of the Fidelity Trust Company, Philadelphia, and J. Sheppard Smith, vice-president of the Mississippi Valley Trust Company. Mr. Gest was chairman of one of the protective committees for holders of St. Louis Transit Company 5 per cent bonds. In Mr. Smith the Mississippi Valley Trust Company will for the first time be represented on the organization committees. That institution is interested in a fiduciary capacity in the securities of both the United Railways and the St. Louis & Suburban Company.

Mr. Watts has said that no fixed plan can be announced at this time, as the ideas thus far developed by the reorganization committee must be submitted to the United States District Court, to the state commission and to the city administration.

As has been indicated previously it is contemplated that the $30,300,000 outstanding general mortgage 4's due in 1934 will remain outstanding, as the reorganization committee has been advised by counsel that there will be no permanent default in these bonds if certain legal requirements are met. Those requirements seem comparatively easy of performance. The financial plan will, therefore, be confined to the Transit 5's, Suburban general 5's, and to the preferred and common stocks Necessarily, the receiver's certificates, the underlying bonds and other temporary or past due obligations will be provided for.

As Mr. Watts sees it the immediate undertakings of the reorganization committee are:

1. To determine with the Public Service Commission, the proper valuation of the properties for the purposes of reorganization.

2. To arrange for a new franchise which will insure proper service and protection to the car-riding public, and which will establish reasonable conditions of operations and define all matters necessary to be determined before reorganization can be accomplished.

3. To prepare and promulgate a financial plan acceptable to the city, the Public Service Commission, the court and the present security holders of the company.

Mayor Henry W. Kiel has declared in favor of an initiative election on a new blanket franchise for the company, which he contends must provide for payment of some $3,000,000 in back mill taxes now due the city.

Newman, Saunders & Company will shortly open an office in St. Louis and place experts at work on the reorganization details immediately.

Earnings of Westchester High-Speed Line Improve

The New York, Westchester & Boston Railway, operating 57 miles of high-speed electric railway out of New York City into Westchester County, for the year ended Dec. 31, 1923, had gross revenues of $1,452,943, an increase of $98,934 over 1922, and balance after taxes of $247,172, equal to 25 per cent of annual interest charges on its $21,390,000 of 4½s, upon which interest is guaranteed and paid by the New York, New Haven & Hartford Railroad.

There was a deficit after charges for the year of $1,616,714, due to $886,727 interest on unfunded debt, chiefly on $16,300.000 notes and advances by the New Haven, in addition to rentals, miscellaneous charges and regular bond interest.

The Larchmont extension, which was put into operation early in 1921 at a cost of $418,500, has shown average annual net income since of $117,707 and for 1923 of $148,400.

P. R. T. Seeks Approval of $1,000,000 Loan

The Philadelphia Rapid Transit Company, Philadelphia, Pa., has requested the city to approve a proposed $1,000,000 bond issue to retire $389,000 of the company's real estate mortgage bonds and to provide funds for necessary transit improvements. This request was contained in a letter to the Council from W. C. Dunbar, president of the company, on April 10. Its presentation was followed by the introduction of an ordinance by the chairman of the committee on transportation and public utilities providing for the city's assent. The subject was referred to his committee. Mr. Dunbar explained that the proceeds of this loan will be used to:

Retire mortgages now outstanding on various parcels of the company real estate, $389,000.

Construct track extensions to the new Southern carhouse now being built at Twentieth and Johnson Streets, $300,000.

Construct and equip a substation at Fox Chase, $90,000.

Add rotary converter at Ranstead substation, $40,000.

Provide emergency and utility equipment and house same, $81.000.

Purchase additional signals, shop facilities and equipment for Market Street elevated, $100,000.

Another Step Taken in New Jersey Readjustment

Formal application has been filed with the Board of Public Utilities Commissioners of New Jersey for approval of a merger of the Public Service Electric Company, the United Electric Company and the Public Service Gas Company. At the same time approval was asked of a plan to change the 500,000 shares of the Public Service Railway of $100 par value into no par value stock, the shares to be exchanged par for par.

The merger is in line with the plans for financial readjustment to which reference has been made before in the ELECTRIC RAILWAY JOURNAL. The new company will be known as the Public Service Electric & Gas Company and will be controlled by the Public Service Corporation. The electric and gas company is expected to be the company to put out future new capital issues.

Assurance is given that the readjustment will not disturb the relationship which the corporation now bears to its subsidiaries or to the public, nor will it affect the holders of underlying gas, electric and railway properties except to improve their position by facilitating the development of the properties.

Indianapolis-Louisville Line Does Well

The gross operating income of the Interstate Public Service Company, Indianapolis, Ind., for the year 1923 was $2,128,679 greater than for 1922, or 49.8 per cent. The net earnings for the last year were $466,698 greater than for 1922, or 48.5 per cent.

The railway department showed an increase in revenue over 1922. Heavy freight and express traffic made necessary the purchase of additional equipment, including three sleeping cars for service between Indianapolis and Louisville, two express motor cars, three express trail cars, ten live stock cars and two convertible ballast cars for use in track maintenance. The interurban tracks were extended into the Bourbon stockyards at Louisville during the year. This materially increased the live stock business. As many as 337 cars of stock have recently been handled in a month. During the year three parlor buffet cars were placed in service on the interurban line between Indianapolis and Louisville. This new service proved popular from the start and two additional cars of the same type are now under order.

STATEMENT OF EARNINGS OF INTERSTATE PUBLIC SERVICE COMPANY FOR YEAR ENDED DEC. 31, 1923

Gross earnings, including merchandise sales	$6,405,343
Operating expenses (including taxes)	4,825,177
	$1,580,166
Miscellaneous income	16,251
	$1,596,417
Rental of leased railway property	165,898
Net earnings	$1,430,519
Interest on funded debt	647,189
	$783,330
General interest and amortization of discount	97,674
Available for dividends	$685,656
Dividends paid and accrued:	
Prior lien stock dividend	250,461
	$435,195
Preferred stock dividend	298,108
Balance carried to surplus	$137,087

As for financial operations, the company retired its first and refunding mortgage, and in lieu thereof executed a new mortgage designed to finance the requirements of the company under existing conditions on more advantageous terms than the older mortgage executed some years ago. Under the new mortgage the company issued $8,192,000 in face amount of first mortgage and refunding gold bonds, Series A, using the proceeds to retire $4,048,000 in face amount of its first and refunding mortgage bonds and $3,044,000 in face amount of divisional underlying bonds of comparatively early maturities and to finance the cost of additions and extensions.

During 1923, the company also issued and sold $358,000, par value, of its preferred stock, and $335,000, par value, of common stock, and issued and delivered $2,000,000, par value, of common stock in connection with the acquisition of various properties in January, 1923. Also during the year $1,100,000, par amount, of prior lien stock was issued and delivered on account of and in connection with the acquisition of various properties in January, 1923; $211,000 par was issued and exchanged for certain outstanding general mortgage bonds of the company amounting to $211,000, and $1,524,700, par amount, of prior lien stock was issued and sold to investors, many of whom are customers of the company, and the proceeds used to pay or reimburse the cost of additions and extensions to the company's property.

The policy of offering the company's prior lien stock to customers, inviting them to become part owners of the company, has resulted in a wider personal interest in its affairs. The company's stockholders increased in number during the year from 1,980 to 4,485.

Scaling Down Planned in Erie Reorganization

Details have been announced of the plan under which it is proposed to reorganize the Buffalo & Lake Erie Traction Company, Erie, Pa. It is proposed that the committee for the holders of the first and refunding mortgage 5 per cent thirty-year gold bonds, through its nominee, shall acquire all the property of the Buffalo & Lake Erie at foreclosure sales. Two new companies will be organized, designated in the plan as the Erie Company and the Interurban Company. The Erie Company will acquire the lines in the city of Erie and the Interurban Company will acquire the purely interurban line.

The Erie company will have a capitalization of $5,000,000 of 6 per cent first and refunding mortgage sinking fund thirty-year gold bonds, of which $1,000,000 are "presently issued"; $1,500,000 of 7 per cent cumulative preferred stock, of which $1,050,750 will be the initial issue, and 60,000 no par value shares of common stock. From the proceeds of $1,000,000 of the sinking fund gold bonds, and other moneys, the syndicate proposes to retire the receiver's certificates now a lien on the property of the Erie Company and to make available the $700,500 cash to be received by the committee. The property will be subject to mortgages and other secured debt.

The Interurban Company's capitalization is to consist of $1,500,000 of first and refunding mortgage 6½ per cent thirty-year sinking fund bonds, $800,000 of which comprise the initial issue; $1,500,000 of 5 per cent noncumulative preferred stock, of which $700,500 will be "presently issued," and

30,000 shares of no par value common stock.

On the basis that all bondholders assent to the plan each holder of a $1,000 bond of the Buffalo & Lake Erie will receive $150 par value of 7 per cent cumulative preferred stock of the Erie Company, amounting to 15 per cent of his holdings; 10 per cent in 5 per cent non-cumulative preferred of the Interurban Company, or a par value of $100; three shares of common stock of the Erie Company, no par value, having an estimated book value of $16.47 a share and aggregating $49.41, and $30 cash on the basis of an estimated available balance for this purpose of $218,900. In other words, each holder of a $1,000 bond will receive new stock of a par value of $299.41 and cash of approximately $30.

The company has been in the hands of a receiver since 1915.

Cleveland Southwestern Wants to Issue Bonds

Application was filed with the Ohio Public Utilities Commission recently by the Cleveland Southwestern Railway & Light Company, Cleveland, Ohio, for authority to issue $4,500,000 in bonds and $4,000,000 in common stock for the purpose of consummating the reorganization of the company formerly known as the Cleveland, Southwestern & Columbus Railway.

Following an order of foreclosure sale by the Federal Court the properties were purchased on March 14 by John Fleek for Hayden, Miller & Company, who acted as reorganizing managers on behalf of all depositing bondholders. The sale was approved by the court, stockholders and directors.

The plan of reorganization calls for the issuance of securities substantially as follows: $800,000 prior lien twenty-five-year 6½ per cent bonds; $175,000 equipment trust certificates; $1,500,000 extended bonds comprising $200,000 Cleveland & Elyria thirty-year 6s, $100,000 Elyria & Oberlin thirty-year 6s, $127,000 Cleveland, Berea, Elyria & Oberlin thirty-year 6s and $1,073,000 Cleveland, Elyria & Western thirty-year 6s; $2,200,000 general and consolidated mortgage thirty-year 5s.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

Loss for 1923 $65,593.—The Fresno Traction Company, Fresno, Cal., reports to the Railroad Commission for the year 1923 that its operating revenue was $430,441 and operating expenses $344,739, giving a net operating revenue of $85,702. The net corporate loss for the year was $65,593. The deficit at the beginning of the year was $621,466. Miscellaneous additions to surplus for 1923 were $75,064 and miscellaneous deductions were $2,425, leaving an accumulated deficit at the end of the year of $614,419.

Approves Track Removal.—The New York Transit Commission announced on April 11 its approval of the proposed condemnation and removal of the tracks of the Sixth Avenue elevated road, at present running from Fifty-third Street to Fifty-ninth Street, and known as the Fifty-eighth Street spur. This will leave the Board of Estimate and Apportionment free to initiate the condemnation proceedings and start the work of removal as soon as it may desire.

Power and Light Properties Included in Sale.—The Warren-Jamestown Street Railway, Jamestown, N. Y., the Warren Street Railway, Warren, Pa., and the interurban line connecting Warren and Sheffield as well as extensive light and power systems of the Warren Traction Company have been sold to the Penn Public Service Corporation, which took over the electric railway properties as of April 10, 1924.

Name to Be Changed.—Steps have been taken by the Northern States Power Company in La Crosse to change the name of its largest division, the Wisconsin-Minnesota Light & Power Company, which supplies city and interurban railway service throughout a large territory in western Wisconsin, to the Northern States Power Company. Formal notice of the proposed action is contained in an amendment to the articles of incorporation of the company recorded recently.

Seeks Partial Abandonment.—The Stark Electric Railroad petitioned the Ohio Public Utilities Commission on April 8 for authority to abandon a part of its tracks in the city of Alliance. The application has been set for hearing May 12. The tracks proposed to be abandoned begin at the west side of Arch Avenue, running west on Main Street to Union Avenue, thence north to the right-of-way of the Cleveland and Pittsburgh tracks, thence on Vine Street.

Suit to Compel Payment of Dividends Dismissed.—The suit filed by holders of participation certificates of the Chicago Railways asking that dividends be ordered paid on certificates has been dismissed by Judge Cliffe of the United State District Court at Chicago. In his opinion Judge Cliffe held that "since the contractual obligations imposed by the plan of reorganization have not been violated, I must grant the motion to dismiss."

Receiver Discharged at Binghamton.—W. G. Phelps has been discharged as receiver of the Binghamton Railway, Binghamton, N. Y., by order of Federal Judge George W. Ray. Earnings of the company for 1923 are as follows: Gross, $1,073,723; net $325,733; interest and taxes, $217,107; balance, surplus, $108,626.

Short Pennsylvania Line Sold.—The Blue Ridge Traction Company, operating an 8-mile line, which connects Danielsville, Edgemont, Berlinsville, Walnutport and Slatington, Pa., was sold recently to H. Sofranscy Company, Allentown, Pa., junk dealers. It is believed that the new owners will scrap the line.

Mortgage Gold Bonds Offered.—Harris, Forbes & Company and A. C. Allyn & Company, Inc., New York, are offering at 100 and interest, yielding 6 per cent, $2,250,000 of refunding mortgage gold bonds of the Columbus Railway, Power & Light Company, Columbus, Ohio. They are known as the 6 per cent series due 1941. The bonds are dated Dec. 1, 1921, and are due Dec. 1, 1941. The Columbus Railway, Power & Light Company does practically the entire commercial electric light and power business in Columbus and vicinity, and does the entire railway business in Columbus.

Seeks Authority to Abandon in Palo Alto.—The Peninsular Railway has applied to the California Railroad Commission for authority to abandon its street railway system in Palo Alto and adjoining territory lying north of the Southern Pacific Company's tracks and to remove the tracks and equipment. The railway had a loss of $8,538 on these lines during 1923 and $12,523 during 1922. The deficit for its entire system for the year 1923 was $377,737.

Representatives of Bankers on Board.—At the annual meeting of the Public Service Corporation of New Jersey, on April 7, Alfred L. Loomis and Landon K. Thorne of Bonbright & Company, New York, were elected to the board of directors. Bonbright & Company have been identified with the recent financing of the company.

Deficit in New Jersey Slightly Larger.—A deficit of $126,922 was reported by the Public Service Railway, Newark, N. J., for February, compared with a deficit of $112,823 in February, 1923. The company is operating under a temporary schedule which provides within the limits of the larger cities served a 5-cent fare with an additional 5-cent charge in the suburbs, no transfers. In all other parts of the territory the rate of 8 cents, four tokens for 30 cents, 1 cent transfer, continues.

Authorizes Bond Issue.—The Key System Transit Company, Oakland, Cal., has been authorized by the Railroad Commission in a supplemental order to execute a deed of trust to secure the payment of its general and refunding mortgage bonds amounting to $20,000,000, and to issue $8,951,000 of such bonds, $1,365,800 bearing interest at the rate of 6 per cent per annum, and $7,585,200 at the rate of 5 per cent per annum, and to use the proceeds to refund outstanding obligations.

Abandonment of Three-Mile Line Approved.—The Public Service Commission, under an order issued April 9, approved the declaration of abandonment by the Huntington Traction Company, Inc., of that part of its line in Huntington, L. I., south of the Long Island Railroad extending along the highway from Huntington to Siding No. 7, a distance of 3 miles, on the understanding that the railroad is to remove all of its structures and place the highway in good condition. The railroad is to continue between the north side of the Long Island Railroad and Halesite. It was asserted at the hearing that if any abandonment is to be permitted, the railroad should not be allowed to retain that part of its line north of the Long Island Railroad in Huntington. The commission holds that so far as this contention is concerned, the evidence is that public interest requires the continued operation of this part of the road, and further, that the commission has no power to compel a street railroad to abandon a portion of its route without its consent.

Personal Items

Mr. Greenland Goes to St. Louis

Fort Wayne Official Retained to Assist in Extensive Work to Be Done in Connection with Reorganization of the United Railways

SAMUEL W. GREENLAND has resigned as vice-president and general manager of the Indiana Service Corporation, Ft. Wayne, Ind., effective May 15, to go to St. Louis as the representative of Newman, Saunders & Company, Inc., New York, to assist them in their work as agents of the reorganization committee of the United Railways. That firm has recently opened offices in St. Louis. The company with which Mr. Greenland is now connected owns and operates the electric railways in Ft. Wayne, Wabash, Peru and Logansport and the interurban lines connecting Fort Wayne with these cities and with Lafayette and Bluffton, Ind., and does a general power and lighting business. In addition to his connection with the Indiana Service Corporation Mr. Greenland is general manager of the Ft. Wayne & Decatur Traction Company and holds a similar position under the receiver of the Ft. Wayne, Van Wert & Lima Traction Company.

IMPORTANT WORK AHEAD

Mr. Greenland's duties at St. Louis have not been specifically defined. There is a vast amount of work to be done in connection with the lifting of the receivership of the United Railways there, and it is to this that Mr. Greenland will at first apply himself. The most important matters to come up immediately are the valuation and franchise questions, with which of course are interwoven the preparation and promulgation of the details of the financial reorganization, in working out which the interests of the city, the public service commission, the court and the present security holders will all have to be reconciled so that the future may best be served.

To the part in this work which Mr. Greenland will take he will bring a combination of exceptional natural talent and a knowledge of utility problems extending over a period of twenty-five years. He is one of the outstanding figures among Middle West railway men, because of his progressiveness in modernizing the operation of the Ft. Wayne properties. A very important piece of work here was his part in the complete recasting of the financial structure of the Ft. Wayne & Northern Indiana Traction Company and the organization of its successor, the Indiana Service Corporation. It seemed like a bitter pill for many of the local security holders to have to accept new substitute securities, with greatly reduced face value, for their former paper. But they had faith in the management and, even though reluctantly, came in on the plan and made possible the initial step toward turning the near-bankrupt property into one able to provide first-class service and make a nice profit on the railway as well as the lighting service.

Since the reorganization, the property has been very nearly wholly re-equipped and rebuilt with the best of rolling stock and increased power facilities, including a changeover to 100 per cent 60-cycle service, doing away with all 25-cycle energy.

S. W. Greenland

In the merchandising of transportation Mr. Greenland has also shown his progressiveness. He was quick to see the virtues of the weekly pass as applied to the conditions confronting him and he has been able to turn that to advantage as a revenue producer and as a means of cementing still closer his friendly relations with the public. And aside from the mechanics of the job, Mr. Greenland has been unusually successful in his relations with his employees, and has in addition made himself a real factor in all the progressive work of the community.

So far as his new work at St. Louis is concerned, it would appear that the future there for him is what he makes it. That being so, Mr. Greenland may be expected to make that future something distinctly worth while to the people of St. Louis and to the investors in that railway.

Mr. Greenland was born at Clarion, Pa., on April 27, 1879. He was educated at the Pennsylvania Military College, Chester, Pa., and at Penn State University, where his work in electrical engineering was concluded in 1900. His first job in the utility field was with the Bell Telephone Company at Pittsburgh in connection with construction work. In 1904 he became connected with Robert W. Watson, consulting engineer, Harrisburg, Pa., where for three years he was engaged principally in making engineering reports for financial interests. In 1907 he became general manager of the Columbus Railway, Light & Power Company, which furnishes the gas, electric light and railway services in Columbus, Miss. At the time the Wabash Valley Traction Company was reorganized to become the Fort Wayne & Northern Indiana Traction Company, in 1911, he went to Fort Wayne as assistant general manager and later in the same year was made general manager. Upon the reorganization of this company into the Indiana Service Corporation in 1920 he was elected vice-president as well as general manager.

FORMER SECTIONAL ASSOCIATION HEAD

Mr. Greenland has been active in the Central Electric Railway Association and served as its president during 1922. In 1917 he served as president of the Indiana Electric Light Association. He is a member of the American Institute of Electrical Engineers and the American Society of Mechanical engineers. During the war he was a major in the chemical warfare section of the army and had charge of the erection of a 20,000-kw. steam generating station at the Edgewood (Md.) Arsenal. He also looked after the operation of the utilities at Edgewood.

W. W. Nielson, assistant to A. E. Reynolds, vice-president and general manager of the Springfield Gas & Electric Company and the Sprinfield Traction Company, Springfield, Mo., has been promoted to assistant general manager of the Tucson Gas, Electric Light & Transmission Company, Tucson, Ariz.

Charles A. Blose, assistant line superintendent of the Indiana, Columbus & Eastern Traction Company for several years, has been appointed superintendent of lines, taking the place made vacant by the transfer of C. R. Holland, former superintendent, to a similar position with the Columbus, Newark & Zanesville Electric Railway. Mr. Blose will establish offices at Zanesville.

E. M. Ashworth has been appointed general manager of the Civic Hydro-Electric Commission of Toronto. At the time when the new Toronto Transportation Commission first met in the fall of 1920 Mr. Ashworth, then secretary and assistant general manager of the Hydro commission, was temporarily appointed secretary. At that time P. W. Ellis was unanimously chosen chairman.

Albert C. Spencer, engineer of way of the Toronto Transportation Commission, has become assistant general manager of the commission, which is responsible for the operation of the municipal railway lines in Toronto.

W. C. Lincoln with Electric Service Supplies

Goes to Chicago from National Railway Appliance Company to Become Western Sales Manager

Willis C. Lincoln has been appointed Western sales manager of the Electric Service Supplies Company with headquarters in that company's Chicago office. Mr. Lincoln has resigned from his former connection as manager of sales and engineering for the National Railway Appliance Company, New York.

Willis Lincoln is well known in the electric railway, the steam railroads and the mining fields. He was one of the first engineer salesmen in the railway field. In fact, he applied his early selling instinct to help finance himself through Union College. With money which he earned by two years sales work with the Brewer-Pryor Piano Company, Mr. Lincoln studied electrical engineering at Union University under the late Dr. Steinmetz, then head of that department of the university. Theory was all right, but Mr. Lincoln wanted practical experience. To get that he entered upon the regular test course of the General Electric Company just as soon as he finished at the university. Next he went with the consulting engineering department of that company. Later he entered the railway engineering department.

W. C. Lincoln

Mr. Lincoln in Selling End

Mr. Lincoln's next work for the company was at selling. This was a logical step, equipped as he was to talk in terms of performance and not in terms of appearance. And so he packed his grip as a sales engineer and covered several states for several years backed by an accurate knowledge of the material his company handled.

When the war broke out in the year 1914 Mr. Lincoln resigned his position with the General Electric Company to take charge of the engineering department of the Railway Improvement Company, New York. Later, as manager of sales and engineering of this company, his knowledge of selling was still further broadened, for with that company he had entire charge of marketing the company's products intended for use by steam and electric railways and in mines and other industrial plants.

J. O. Wilson Resigns from Cleveland-Southwestern

A quarter of a century of service with the Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, is the record of J. O. Wilson, who resigned, effective April 15, to accept a position as executive president of the Harvard Savings & Loan Company and the Harvard Mortgage Company. Mr. Wilson started in as a clerk in 1899 with the Cleveland-Southwestern properties, and worked his way up through almost every department to the executive position of secretary and treasurer, which position he held at the time of his resignation.

Alcide E. Beauvais has been elected president of the Montreal Tramways & Power Company, Montreal, Que., succeeding William C. Finley. E. A. D. Morgan and Evariste Champagne have been elected directors. The vice-presidency has not yet been filled and there remain three vacancies on the directorate.

J. E. Heston, formerly superintendent of shops of the Interstate Public Service Company at Scottsburg, Ind., has resigned, effective May 1, to enter other fields of work. Mr. Heston entered the service of the Union Traction Company of Indiana in September, 1900, and with the exception of two and one-half years, when he was in the service of the Winona Interurban Railway, was with that company continuously until May 15, 1923. It was on that date that he entered the service of the Interstate company.

Albert Swartz, formerly a receiver for the Toledo & Western Railroad, Toledo, Ohio, has been retained by the successor company and will have complete charge of operations. He was vice-president of the Community Traction Company at its beginning and previous to that time was in the employ of the Toledo Railways & Light Company and the Toledo & Western Railroad. He served a short time in the New York offices of Henry L. Doherty & Company, New York, after graduation from Toledo schools. His preliminary engineering work was done on railroads near Toledo. Mr. Swartz will continue to reside in Toledo. He will have his offices at Sylvania, at which place the headquarters of the Toledo & Western are located.

L. Sommers, formerly superintendent of way, subway and elevated division of the Philadelphia Rapid Transit Company, Philadelphia, Pa., has recently been appointed assistant operating manager of the subway and elevated division. C. C. Haney has been made operating manager.

Raymond Page has become manager of the Hornell Traction Company, Hornell, N. Y., following the vote of the bondholders to have the interests of the company turned over to Mr. Page and W. C. Whitaker. Robert W. Bull retires as receiver.

John R. Marshall Promoted in New Brighton

John R. Marshall, chief dispatcher of the Beaver Valley Traction Company and the Pittsburgh & Beaver Street Railway, New Brighton, Pa., has been advanced to the position of superintendent of transportation. The appointment of Mr. Marshall followed the change in general managership made effective when W. H. Boyce accepted the position of commercial manager with the Pittsburgh Railways and was succeeded at New Brighton by Clinton D. Smith as general manager.

Mr. Marshall has been with the company since 1902. In his early years of association with the Beaver Valley company he accepted a job as motorman at the request of John Buchanan, then president of the Beaver Valley Traction Company. For three years he operated a car, at the same time learning the duties of a conductor. Later he was advanced to assistant dispatcher. A year after he was made chief dispatcher, and it is this position which he now vacates to become superintendent of transportation.

J. R. Marshall

Mr. Marshall was born on a farm on April 6, 1869. He has always made Beaver County his home. He attended the country schools, but as the oldest of eight children, he early obtained a job and board on a farm. His next venture was turning a boring wheel for ten hours a day at a wage of 50 cents a day. He spent seven years in a lumber camp and two years as a tool dresser and teamster in the oil fields of Butler County. Mr. Marshall's father died in 1897 and for five years thereafter he conducted the homestead farm. Later he moved to Beaver with his mother.

Obituary

J. S. Simpson

J. S. Simpson, auditor of the Washington Water Power Company and the Spokane United Railways, Spokane, Wash., died very suddenly on April 5, following an attack of apoplexy. He had been connected with the companies since 1918. Before that Mr. Simpson was chief accounting officer of the Washington Public Service Commission. Mr. Simpson was born at Greenland, N. H., in 1871. His first business connection was with the Thomson-Houston Company at Boston. He remained with that company and its successor, the General Electric Company, until 1901. In that year he went to Tacoma to enter the employ of Stone & Webster. D. L. Huntington, president of the enterprises of which Mr. Simpson was an officer, said that "not only had the companies lost a valuable man, in the death of Mr. Simpson, but that the city and the Inland Empire had lost a real friend."

J. E. Barhite

John E. Barhite, for eleven years special County Judge of Monroe County and a member of the Public Service Commission for the Second District of New York from 1917 to 1921, died in Rochester on April 2. He was appointed Public Service Commissioner by Gov. Charles S. Whitman upon the recommendation of the late George W. Aldridge, Rochester, Republican leader. Mr. Barhite was sixty-seven years old.

Lyman K. Brown, for many years treasurer of the Fonda, Johnstown & Gloversville Railway, Gloversville, N. Y., died recently at the age of seventy-five years.

Frank M. Harris, treasurer of the Des Moines City Railway, Des Moines, Iowa, died recently. He had been connected with the Des Moines City Railway since 1897. At the time of his death he was treasurer and general purchasing agent for the company. Mr. Harris was born in the city of Cleveland, Ohio, in 1865.

William C. Hawkes, seventy-nine years old, of Dorchester, died recently at Newton, Mass. Had it not been for a brief period when he was away from Boston, he would have had a record of the longest unbroken service with the Boston Elevated Railway. His first railway connection was with the old Lynn & Boston. Later he became connected with the Highland Street Railway, Boston.

Andrew L. Campbell, formerly chief of the electrical repair department of the United Electric Railways, Providence, R. I., died recently. He was first employed at the power station and later was placed in charge of substations. He had been with the company twenty-seven years.

John Freeman, formerly in the employ of the Northern Ohio Traction & Light Company, Akron, Ohio, died recently at the age of sixty-three years. He entered the service of the company in 1897 as motorman on the Akron city division. One year later he was appointed inspector. Later Mr. Freeman was transferred to New Philadelphia in charge of the lines in that section. Following this assignment he went to Canton as assistant to D. A. Scanlon, then superintendent of the southern division. In 1917 he was retired from service. He was the father of O. L. Freeman, present Akron city superintendent.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Further Reduction in Varieties of Paving Brick

At a meeting of the permanent committee on simplification of varieties and standards of vitrified paving brick of the United States Department of Commerce, held in Washington, D. C., March 28, the recognized types and sizes of vitrified paving brick were reduced from six to five. Since the first conference on paving brick simplification was held Nov. 15, 1921, manufacturers throughout the country have reduced the number of types and sizes of vitrified brick used for highway paving and street track paving from sixty-six to five.

The recognized types and sizes as determined upon by the committee through a process of elimination over three years are: Plain wire cut brick, 3 in. x 4 in. x 8½ in. and 3½ in. x 4 in. x 8½ in.; repressed lug brick, 4 in. x 3½ in. x 8½ in.; wire cut lug brick, 3 in. x 3½ in. x 8½ in. and 4 in. x 3½ in. x 8½ in.

The one type and size eliminated by the committee at its last meeting was the 3½-in. x 3½-in. x 8½-in. wire cut lug (Dunn). This elimination, like all eliminations that have taken place since the work of simplification was taken up by the committee, was determined upon only after a survey of the industry's shipments revealed that certain sizes had steadily declined in favor among engineers of the country to a point where they constituted an exceedingly small percentage of the total shipments of the industry.

For guidance at this and future meetings the committee adopted a resolution to the effect that "any variety of brick which shows less than 2½ per cent of total shipments for three consecutive years be eliminated and that any variety of brick which shows 5 or more per cent of the shipments for three successive years be reinstated in the list of recognized types and sizes unless special technical or other reasons show that such action is undesirable; provided, further, that the recognized types and sizes shall represent not less than 75 per cent of production."

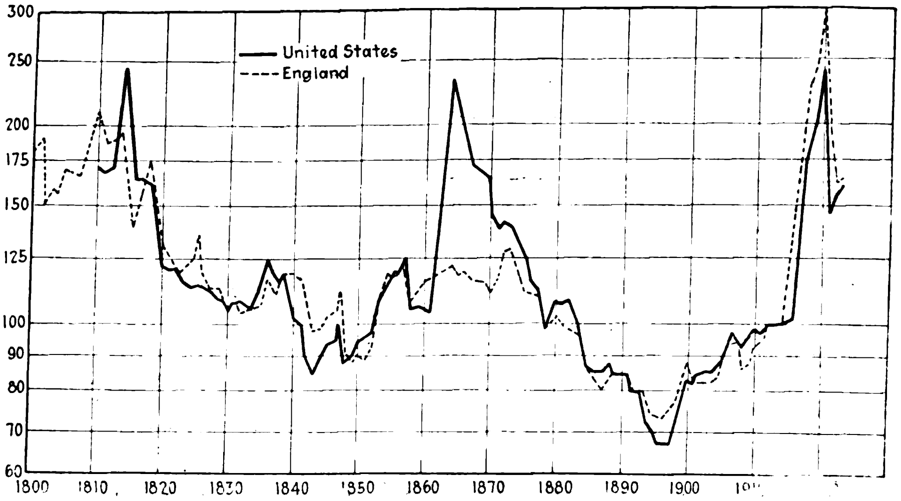
The survey of the paving brick industry made in connection with the simplification conference reveals the fact that the industry has experienced a steady growth since the year of lowest production in 1918. In 1923 shipments reached the high figure of 453,864,183.

G. E. First Quarter Orders Show Decrease

Orders received by the General Electric Company, Schenectady, N. Y., for the three months ended March 31 total $73,487,903, Gerard Swope, president, announced recently. This is a decrease of 8 per cent over the first quarter of 1923, when orders totaled $80,010,045.

Commodity Prices Here and in England Since 1810

In testifying in the International Railway valuation case, referred to in the ELECTRIC RAILWAY JOURNAL, issue of April 12, Dr. Jacob H. Hollander, professor of political economy in Johns Hopkins University, presented the originals of a number of charts in support of his conclusions. Among them were studies showing the trend of prices in the United States from 1913 to 1923, bank credit, gold reserves and federal reserve notes, 1919-1923; prices in the United States, 1913-1923; production in basic industries and volume of business, 1919-1923, and commodity prices in the United States, 1810-1923, and in England, 1800-1923, the last reproduced herewith.



Commodity Prices in the United States, 1810-1923, and England, 1800-1923.
Prices in 1924 = 100

Electric Drills Reduced in Price

An increased rate of production, resulting from the greater demand for electric tools, has enabled the Hisey-Wolf Machine Company, Cincinnati, to reduce its prices. The new price list became effective on March 17. Electric drills of the more popular sizes have been reduced in price from 12½ per cent to 17 per cent. Other reductions range from 5 to 10 per cent.

$22,988 Awarded to 1,752 General Electric Workers for Suggestions

Awards totaling $22,988 were paid to 1,752 employees of the General Electric Company during 1923 for suggestions which increased the efficiency of the company's operations. The suggestions ranged from safety devices for the protection of workers to improved methods of manufacturing electrical apparatus. The highest awards amounted to $500.

During the year 8,078 suggestions were filed, representing about one-tenth the employees of the company. The Philadelphia works leads, with 43 per cent of its workers offering suggestions, and the Edison Lamp Works at Harrison, N. J., tops the list in suggestions accepted, with 48 per cent.

Suggestions are sent to a special committee in each works. This committee investigates the suggestion, passes upon the merit and either makes an award to the man or woman who made the suggestion or explains why the suggestion cannot be effectively adopted. In most cases the award is made within a few weeks after the suggestion is received.

Metal, Coal and Material Prices

Metals—New York	April 15, 1924
Copper, electrolytic, cents per lb.	13.475
Copper wire base, cents per lb.	15.875
Lead, cents per lb.	8.15
Zinc, cents per lb.	6.38
Tin, Straits, cents per lb.	49.25
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.20
Somerset mine run, Boston, net tons	2.35
Pittsburgh mine run, Pittsburgh, net tons.	1.875
Franklin, Ill., screenings, Chicago, net tons	2.175
Central, Ill., screenings, Chicago, net tons.	1.90
Kansas screenings, Kansas City, net tons.	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.65
Weatherproof wire base, N.Y., cents per lb.	17.50
Cement, Chicago net prices, without bags.	$2.20
Linseed oil (5-bbl. lots) N. Y., per gal.	$0.93
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal.	$0.99

Rolling Stock

Menominee & Marinette Light & Traction Company, Menominee, Mich., proposes to buy seven new cars at a cost of $50,000.

Grand Rapids Railway, Grand Rapids, Mich., is planning the purchase of twenty new cars.

Department of Street Railways, Detroit, Mich., has just awarded contracts for seventy-five new Peter Witt type cars and will ask for ten new three-car trains similar to the one which has been tried out on the Detroit city lines and is now in operation on Woodward Avenue. Although bids have been asked for 100 new Peter Witt type cars of the large model, contracts were awarded for only seventy-five, street railway officials having decided, after the favorable results obtained from the three-car train, to ask for bids on ten such trains, thus making 105 new cars in all, counting the Peter Witt cars.

Track and Line

Pacific Electric Railway, Los Angeles, Cal., will shortly start extending its track through the heart of Belmont Shore Place and Naples, by way of Second Street. Approximately 7,000 ft. of track will be laid, beginning at Livingston Drive, bridging Alamitos Bay and continuing on through Naples to connect with the Newport-Los Angeles line.

Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich., has doubled its trackage on the docks at Grand Haven.

Toronto Transportation Commission, Toronto, Canada, has already assigned employees to the rearrangement of poles and wires necessary to permit the laying of the curves which will connect the Parliament Street line with the Bloor Street tracks. The rails will be connected with the Bloor Street line and with the loop, which will be built on the plot of land lying east of Parliament and immediately south of the viaduct. It is expected that track laying will start soon and that the loop will be in use within a month.

Seattle Municipal Railway, Seattle, Wash., may build an extension of the Cowen Park line if the petition recently put before the City Council meets with approval. City Engineer J. D. Blackwell estimates the cost of the proposed extension at $125,000, which would pay for the laying of a double track from the present terminus of the line to East Sixty-fifth Street, and for the laying of a single track from East Sixty-fifth Street to Bothell Way, the proposed new terminus. This estimate includes a trestle across the park gulch. For the $125,000 expenditure, 2,100 50-ft. blocks would be included in the assessed district.

Trade Notes

Ohmer Fare Register Company, Dayton, Ohio, in order to complete the acquisition of the American Taximeter Company, New York, and to meet the demands of the company's fast-growing business, has arranged with Spitzer, Rorick & Company, Toledo, for an offering of $600,000 of the 7 per cent serial gold notes. The notes, offered at 101 and interest, are dated April 1, 1924. The American Taximeter Company manufactured a taximeter of the non-recording type which will hereafter be manufactured by the Ohmer Fare Register Company. The plan for the acquisition of this property by the Ohmer Fare Register Company was described in detail in the ELECTRIC RAILWAY JOURNAL, issue of March 15, page 437.

Yale & Towne Manufacturing Company, Stamford, Conn., recently appointed Herbert Charles Rahm advertising manager. In this capacity he succeeds Francis Juraschek, who resigned to enter business for himself. The new advertising manager's first position was as clerk in the advertising department of P. & F. Corbin in New Britain, Conn. In 1915 he received an offer from Sargent & Company to enter its service. Here he took care of all the catalog work. In September, 1922, he went with Yale & Towne as assistant advertising manager. Since August of last year he has been in full charge of the advertising department owing to the continued illness of Mr. Juraschek.

William Lintern, president of the Nichols-Lintern Company, Cleveland, has made a business trip to New England and the Eastern cities. He reports his trip productive of much valuable data relative to the new stop-light which his firm is about to place on the market. He promises a definitive advance, in the shape of a highly simplified system, which will reduce installment and maintenance costs to a minimum.

New Advertising Literature

Century Wood Preserving Company, Pittsburgh, Pa., has issued a bulletin on the "Shipley Treating Unit." The bulletin describes the effectiveness, advantages, construction and capacity as well as uses and availability of the "Shipley Treating Unit."

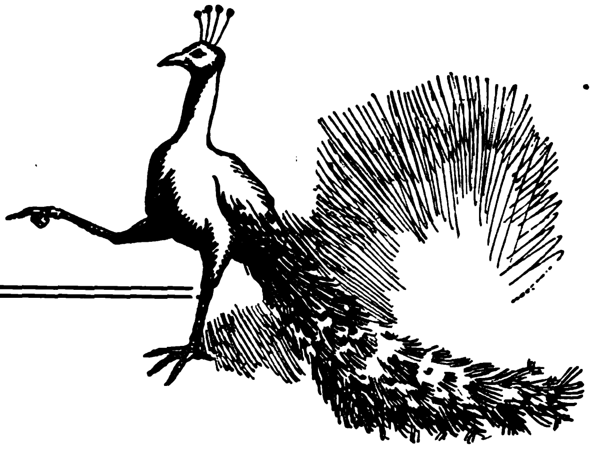
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently published a new booklet, known as Folder 4532-A, dealing with Westinghouse fabrics and papers for insulating purposes. All the forms of treated and untreated fabrics, papers, sleeving, tapes, cord and thread manufactured by the company are fully described in the booklet and their principal applications given. The materials described in this folder are used in the manufacture of Westinghouse electrical apparatus and made available to the general trade.

Crouse-Hinds Company, Syracuse, N. Y., has issued folder No. 12 entitled "Condulets for Concealing in Concrete."

Detroit Electric Furnace Company, Detroit, Mich., has just issued a new publication on brass melting. This booklet tells, first, that the electric furnace is a factor of ever increasing value in brass melting. It next enumerates the economies effected by the electric furnace, and then shows how complete control of analysis, color, texture and homogeneity of the alloy is secured through the electric furnace.

Page & Hill Company, Minneapolis, Minn., has issued a new publication called "Practical Information About Cedar Poles and Butt-Treating." This handbook covers information on the storage of poles, painting of poles, the proper and improper methods of unloading cars, counting and tallying and other practical data for use of engineers, purchasing agents, yard superintendents, foremen and foremen of line crews.

—it's the way it works that counts!



Peacock Staffless Brake

Meets All Requirements

Because it is more powerful, quicker-acting, and of greater chain-winding capacity, the Peacock Staffless Brake is superior for safety cars. That's why it has been chosen over other hand brakes on many roads.

It's not a matter of looks, finish, sentiment or even first cost. It's a question of getting a dependable hand brake, with an established reputation for fulfilling its job in case of emergency. The Peacock Staffless Brake is known to this field as the first satisfactory solution of the safety car hand brake problem.

It meets the other requirements too—occupies minimum platform space, is light in weight and without question is most economical in the long run.

Specify
Peacock Staffless for Safety Cars.

National Brake Co., Inc.
890 Ellicott Sq., Buffalo, N. Y.
Canadian Representative:
Lyman Tube & Supply Company, Limited, Montreal, Canada

Professional Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

The J. G. White Engineering Corporation
Engineers—Constructors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation Management
52 Vanderbilt Ave., NEW YORK

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation, Studies on Financial and Physical Rehabilitation Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINCKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND NEW YORK
1570 Hanna Bldg. 84 Pine St.

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HUMAN ENGINEERING
Railway Audit and Inspection Company, Inc.
Fourth and Chestnut Sts., Philadelphia
Boston New York } BRANCHES { Baltimore Atlanta
New Orleans Pittsburgh Chicago St. Louis

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

Byllesby Engineering & Management Corporation
208 S. La Salle Street, Chicago
New York Tacoma

AMERICAN BRIDGE COMPANY
EMPIRE BUILDING, 71 BROADWAY, NEW YORK

Manufacturers of Steel Structures of all classes, particularly
BRIDGES AND BUILDINGS

SALES OFFICES:

NEW YORK, N. Y. . Empire Bldg., 71 Broadway
Philadelphia, Pa., Widener Bldg., N. W. Cor. Chestnut and Juniper Sts.
Boston, Mass. . . . . 120 Franklin St.
Baltimore, Md., Continental Bldg., Cor. Calvert and Baltimore Sts.
PITTSBURGH, PA. . Frick Bldg., 440 Fifth Ave.
Cincinnati, Ohio . Union Trust Bldg., 36 East 4th St.
Cleveland, Ohio . Guardian Bldg., 629 Euclid Ave.
Detroit, Mich. . . Beecher Ave. and M. C. R. R.
CHICAGO, ILL. . . . 208 South LaSalle St.
St. Louis, Mo., Liberty Central Trust Bldg., 506 Olive St.
Denver, Colo., First National Bank Bldg., 820 17th St.
Salt Lake City, Utah, Walker Bank Bldg., 175 S. Main St.
Duluth, Minn. . Wolvin Bldg., 229-31 West 1st St.
Minneapolis, Minn. . . 629 2nd St., S. E.

Pacific Coast Representative:
U. S. Steel Products Co., Pacific Coast Dept.

San Francisco, Cal., Rialto Bldg., 116 New Montgomery St.
Portland, Ore. . . Selling Bldg., 322 Adler St.
Seattle, Wash. . . 4th Ave. So., Cor. Conn. St.

Export Representative: United States Steel Products Co., 30 Church St., N. Y.

J. ROWLAND BIBBINS
Engineer—927 Fifteenth St., WASHINGTON
TRANSPORTATION SURVEYS
Organized Traffic Relief and Transit Development
Co-ordinating Motor Transport, Railroad and City
Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

C. B. BUCHANAN President W. H. PRICE, JR. Sec'y-Treas. JOHN F. LAYNG Vice-President
BUCHANAN & LAYNG CORPORATION
Engineering and Management, Construction,
Financial Reports, Traffic Surveys
and Equipment Maintenance
BALTIMORE 825 Equitable Bldg. Phone: Hanover 2142 NEW YORK 49 Wall Street

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to
Improve Service and Increase
Efficiency of Operation
PIQUA, OHIO

Transmission Line and Special Crossing
Structures, Catenary Bridges
WRITE FOR OUR NEW DESCRIPTIVE CATALOG
ARCHBOLD-BRADY CO.
Engineers and Contractors SYRACUSE, N. Y.

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and
Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. Richmond, Va.
Established Feb. 1913.

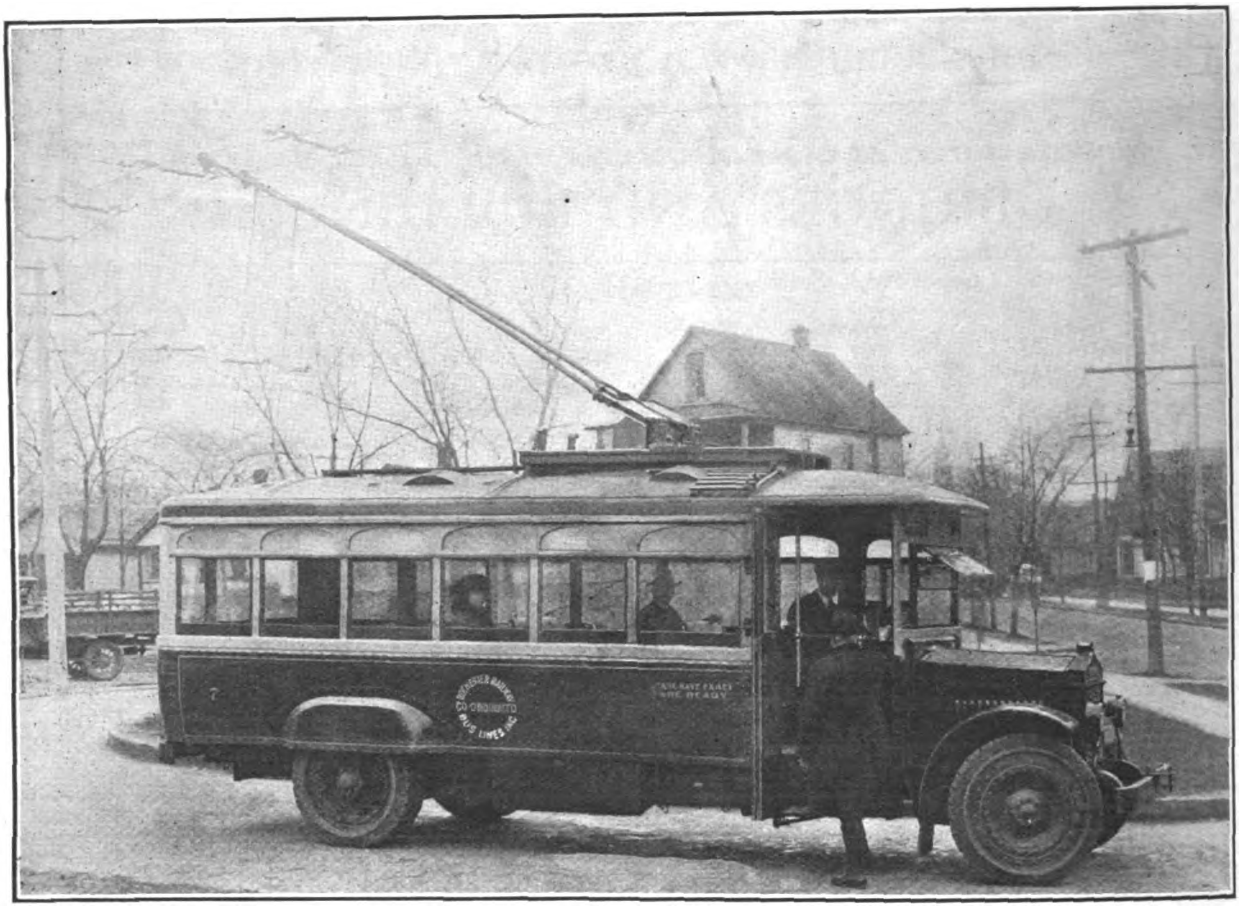
Dwight P. Robinson & Company
Incorporated
Design and Construction of
Electric Railways, Shops, Power Stations
125 East 46th Street, New York
Chicago Youngstown Atlanta Philadelphia
Los Angeles Montreal Rio de Janeiro

THE P. EDWARD WISH SERVICE
50 Church St. NEW YORK *Street Railway Inspection* DETECTIVES 131 State St. BOSTON

When writing the advertiser for information or
prices, a mention of the Electric Railway
Journal would be appreciated.

A. L. DRUM & COMPANY
Consulting and Constructing Engineers
VALUATION AND FINANCIAL REPORTS
RATE STUDIES FOR PRESENTATION TO PUBLIC SERVICE
COMMISSIONS
CONSTRUCTION AND MANAGEMENT OF
ELECTRIC RAILWAYS
230 South Clark Street Chicago, Ill. 215 South Broad Street Philadelphia, Pa.

The Brockway Trackless Trolley



One of nine Brockway Trackless Trolley Cars operated by New York State Railways, Rochester, N. Y.

Making the "thin" routes *pay well*

Probably you could put your finger on two or three routes in your system that barely pay, or even are operated at a loss. Probably too, there are several newly developed districts where there is a need for transportation, though the cost of new tracks would be prohibitive.

SEE BACK COVER

Why not make "thin" routes pay well, by operating trackless trolleys? Installation cost is comparatively low,—your present barns and mechanics can handle the maintenance—operating cost is less than the average street car. Let us figure with you?

AERA

Brockway PASSENGER BROCKWAY EQUIPMENT TRANSPORTATION **Corporation**

Cortland, New York

Originators of low center of gravity transportation equipment

Watch for it!

ANNUAL

Roll Call

WHITE TRUCK FLEETS OF 10 OR MORE

——in the May 10th issue of The Saturday Evening Post

THIS year again the White Roll Call tells transportation's biggest truck story.

Each year this remarkable advertisement is published nationally and each year it shows an increasing tendency on the part of truck buyers to quit shopping for motor trucks and buy assured transportation from The White Company.

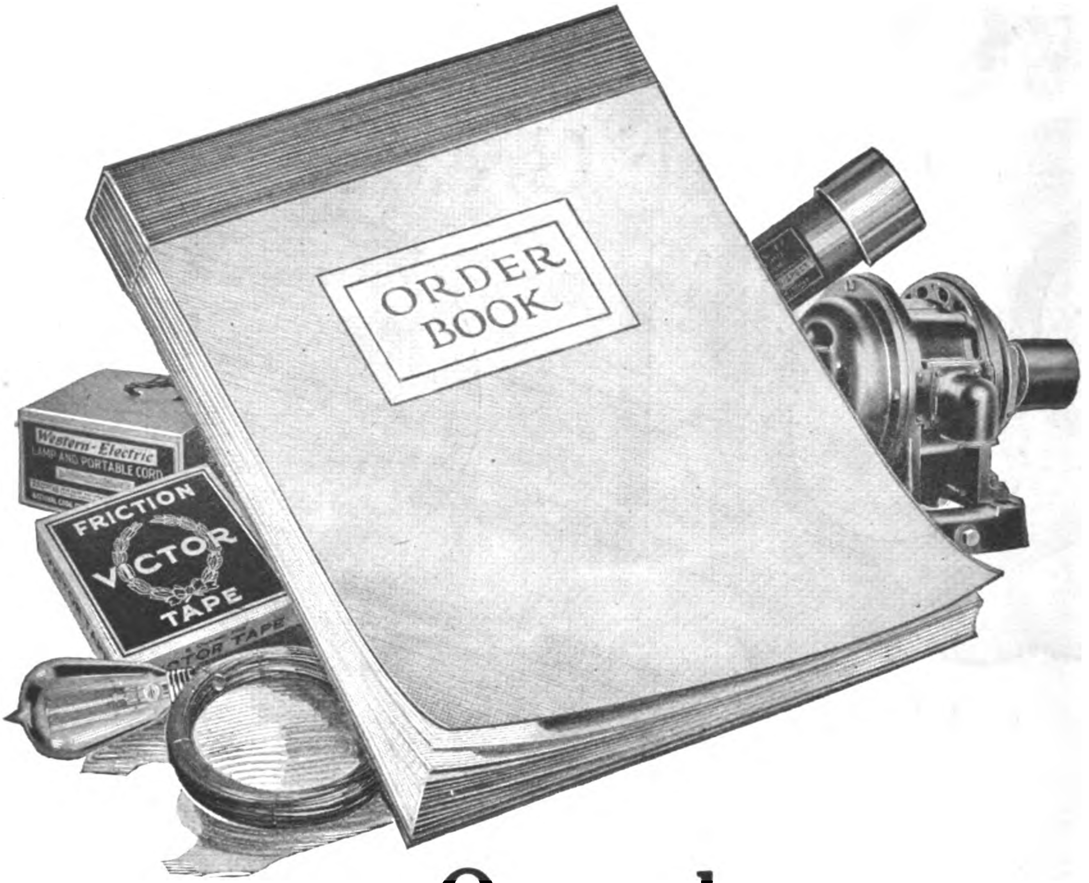
This year the White Roll Call will be published in The Saturday Evening Post May 10th. It will show a tremendous increase in the number of owners of fleets of 10 or more Whites and in the number of Whites these owners operate.

Before you buy a motor truck or a motor bus, study the White Roll Call. We will be glad to mail it to you in booklet form—the names of the hundreds of fleet owners to whom, year after year, Whites have been giving the most money-earning miles.

The White Roll Call is a fact structure defying imitation. It is industry's answer, born of experience, to the question: "What equipment shall I buy?"

THE WHITE COMPANY
842 E. 79th Street *Cleveland*

WHITE TRUCKS


ORDER BOOK
Western-Electric
LAMP AND PORTABLE CORD
FRICTION VICTOR TAPE

One order covers them all!

Save time! Save clerical work! Make out one general order instead of many for your electrical supplies — Sunbeam Mazda lamps, sockets, receptacles, lighting fixtures, conduit, rubber covered wire, motors, fuses, tapes, flexible cord, outlet boxes, porcelains. In fact "Everything Electrical."

There is a Western Electric Distributing House fully stocked near enough to assure you complete and speedy deliveries. Call on it to supply you.

Western Electric Company

OFFICES IN 47 PRINCIPAL CITIES

GREATER COMFORT—GREATER SPEED—GREATER SAFETY—GREATER PROFITS

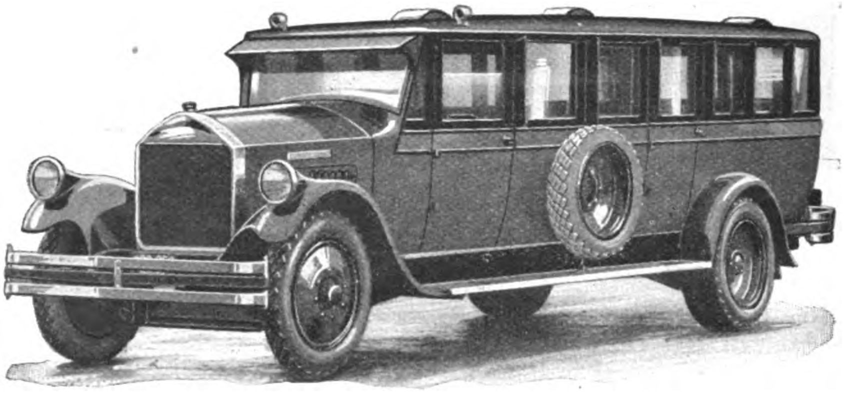
Pierce-Arrow Busses Win *Friends* —and Earn Greater Profits

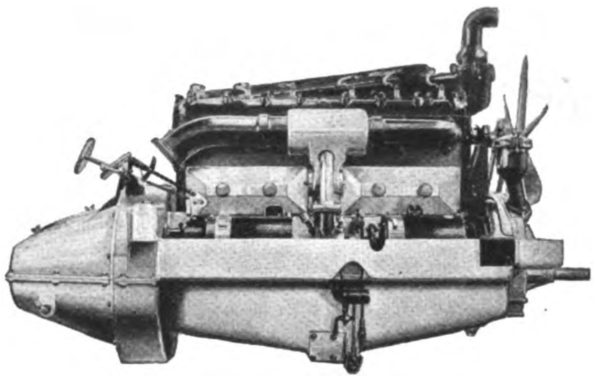
Standard Chassis

$4600

for 196-inch wheelbase, $4750 for 220-inch wheelbase, at Buffalo. Including starter, battery, generator, solid tires and electric lights. Pneumatic tires and disc wheels optional at extra cost.

Terms if desired





The Pierce-Arrow 6-Cylinder Bus Engine

The silent Dual-Valve, Dual-Ignition Pierce-Arrow Bus Engine develops over 100 horsepower at 2500 revolutions per minute. Road speeds of from 45 to 50 miles an hour can be maintained readily, if desired. Six-cylinder flexibility reduces gear-shifting.

* * *

It is a demonstrable fact that the Pierce-Arrow Motor Bus is more comfortable and more stable than a Limousine. Sidesway is absent. The long wheelbase is one reason for this. The exceptionally wide tread is another. Perfect spring suspension is another. Passengers can ride for hours at high road speeds without fatigue.

* * *

We will gladly arrange for a complete demonstration of the Pierce-Arrow Motor Bus at the factory or at principal distributing points.

The name Pierce-Arrow represents the utmost in luxurious motor transportation. It attracts riders—and every Pierce-Arrow rider is a *satisfied* passenger. He rides oftener and praises the luxury and comfort of the service to his friends.

Electric railways who extend or augment their facilities with modern Pierce-Arrow Motor Busses win the good-will of thousands of patrons—and insure greatly increased revenue.

From an operating standpoint, Pierce-Arrow Motor Busses are ideal. They maintain fast headway. The silent, vibrationless 100 horsepower engine is surprisingly economical. They cost less to run and less to maintain. They maneuver easily; the turning radius is unusually short. They are as easy to drive as a big touring car.

Our engineers will be glad to go into detailed facts and figures with railway representatives. And the coupon will bring interesting information about the bus, itself.

* * *

The Pierce-Arrow Motor Bus Chassis, produced in two lengths of wheelbase, will accommodate the de luxe, sight-seeing or pay-enter types of wood or steel bodies, ranging from 18-passenger capacity upward.

THE PIERCE-ARROW MOTOR CAR COMPANY
Buffalo, N. Y.

Pierce-Arrow

SEND THIS COUPON FOR FULL INFORMATION

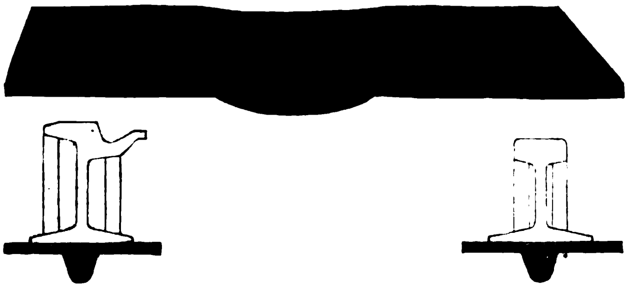
THE PIERCE-ARROW MOTOR CAR CO., Buffalo, N. Y.

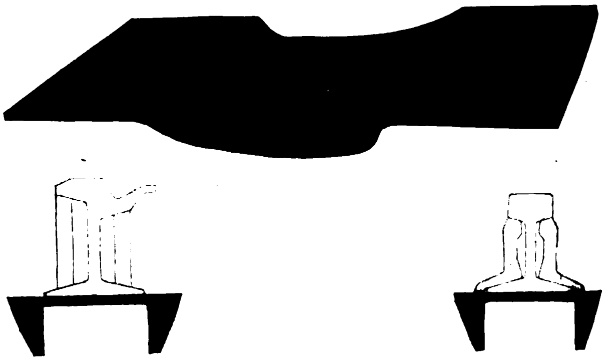
Gentlemen: Please send me literature and complete information about the Pierce-Arrow Six-Cylinder Motor Bus and various types of bodies.

Name..........

Address..........

Support the Rail Joint!



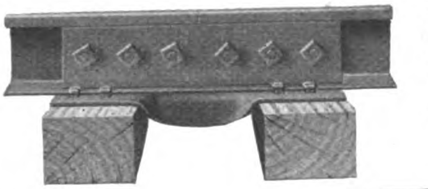


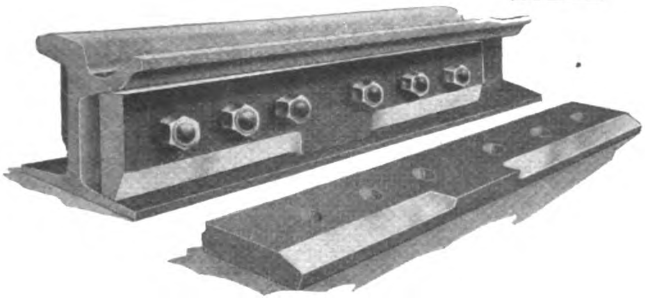
Center Rib Base Plate

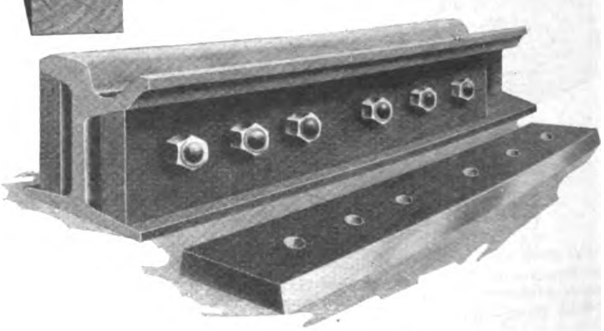
The Center Rib Base plate provides reinforcement and support directly under the center of the rail. It supports the joint and prevents "battering," or "cupping" of the rail ends. It is designed for use with either bolted or welded joints — in the latter case the plate is usually welded to the rail, thus imparting additional strength and stiffness to the joint. Particularly adapted for reinforcing old joints.

Abbott Base Plate

In the Abbott Base Plate the reinforcement is located on each side of the rail instead of in the center. The joint is thus supported and "battering" and "cupping" of the rail ends is prevented. It may be used with either bolted or welded joints — in the latter case it is usually welded to the rail, thereby imparting additional strength and stiffness to the joint. Particularly adapted for reinforcing old joints.





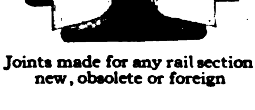


Machine Fitted Joint, Design 983

Machine Fitted Joints, Design 983 are made from heavy rolled steel bars and are first cut to length and punched. As the last operation, the top and bottom are accurately machined to a true bearing surface free from kinks, wind, burrs, and mill scale. The special top and bottom bevel is provided for electric seam welding. In this design the bottom is reinforced at the center of the joint. A special steel is used so as to secure maximum strength in the weld. Joints can be made in any length, thickness or drilling.

Machine Fitted Joint, Design 980

Machine Fitted Joints, Design 980 are made from heavy rolled steel bars and are first cut to length and punched. As the last operation the top and bottom are accurately machined, producing a true bearing surface, free from kinks, wind, burrs, and mill scale. The joints are made in any length, thickness or drilling to fit any rail section: foreign, domestic, obsolete, new or worn. Where rails are old, rusty and corroded the joint can be made oversize. Special designs are made for either electric seam weld or bolted joints.



Joints made for any rail section: new, obsolete or foreign

BETHLEHEM STEEL COMPANY, ***General Offices:*** **BETHLEHEM, PA.**

Sales Offices:

New York Buffalo Boston Cleveland Philadelphia Detroit Baltimore Cincinnati Washington Chicago St. Louis Atlanta San Francisco Pittsburgh

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM

TIMKEN

500
300
SPECIAL LIMIT'D STOPS
D T A CO

More Miles
for More People

The motor coach adds its quota to our total transportation. Whether double-decker in the city or single on the interurban highway, it creates new business, not only for itself, but for steam and electric lines as well.

The key notes in its progress are comfort, convenience and safety; and in its development, as in that of every other type of automotive vehicle, Timken-Detroit Axles have played an important part.

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT, MICHIGAN

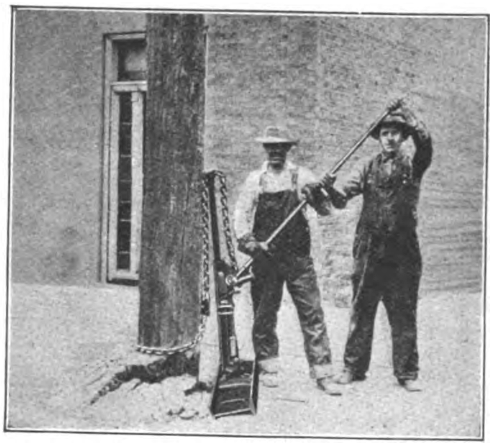
AXLES

"Jack 'em out" **SIMPLEX** "Jack 'em out"

JACKS **JACKS**

With Simplex Jacks You Don't Have to "Monkey" Poles

Do *Your* Men Waste Time and Money That Way?



Two Men and a Simplex Pole Pulling and Pole Straightening Jack will do the job Quicker and Cheaper

Recently a large pole was pulled in 8 minutes, while another pole was straightened in less than two.

No. 329 Simplex Pole Pulling and Pole Straightening Jacks can be utilized any number of ways in the handling of poles—for instance, an important one is to move loaded poles without interference to the overhead wires.

That's quite a feat, but when the road crew has the assistance of the greater man power inherent in Simplex Jacks, there comes at once a feeling of security and certainty that the job will be accomplished without mishap. Simplex jacks produce contented workmen, resulting in maximum efficiency.

Distributed by

Western Electric Company

Offices in 47 Cities

Manufactured by

Templeton, Kenly & Co., Limited

Established 1899 Sole Manufacturers
Chicago Ill. U.S.A.

The Enemies of your pavement and road-bed—

Water	Heat	Cold	Snow	Chains	Impact	Age
seeping thru to ties and cross-rods	compelling expansion that ruins rigid surfaces	with the irresistible upward thrust of freezing	forcing traffic to the center of street	hungrily gnawing at your pavement's surface	of your own cars as well as heavy trucks	the deadly foe of many paving materials

—How will you resist them?

NOT by paving with materials which rain, temperature changes, or age deteriorate.

Not by paving with materials which are quickly abraded by traffic's wheels and chains.

Not by paving with materials that are inelastic and hence crack under impact or expansion.

Not by paving in a way that permits water to seep thru to ties and cross rods.

Only one pavement—at reasonable cost—meets the demands of your work—the *"ABC" pavement surfaced with asphalt-filled vitrified brick.*

Write for specifications—you'll quickly realize why you will profit by standardizing on this modern construction.

VITRIFIED
Brick
PAVEMENTS
OUTLAST THE BONDS

NATIONAL PAVING BRICK MANUFACTURERS ASS'N, Engineers Bldg., Cleveland, Ohio

Albion Shale Brick Company
Albion, Ill.
Alton Brick Company
Alton, Ill.
Barr Clay Company
Streator, Ill.
Binghamton Brick Company
Binghamton, N. Y.
Cleveland Brick & Clay Company
Cleveland, Ohio
Clydesdale Brick & Stone Co.
Pittsburgh, Pa.
Coffeyville Vitrified Brick & Tile Co.
Coffeyville, Kans.
Collinwood Shale Brick Company
Cleveland, Ohio
Corry Brick & Tile Company
Corry, Pa.
Francis Vitric Brick Company
Boynton, Okla.

Georgia Vitrified Brick & Clay Co.
Augusta, Ga.
Globe Brick Company
East Liverpool, Ohio.
Hammond Fire Brick Company
Fairmont, W. Va.
Hocking Valley Brick Company
Columbus, Ohio.
Independence Paving Brick Co.
Independence, Kans.
Mack Mfg. Company
Wheeling, W. Va.
C. P. Mayer Brick Company
Bridgeville, Pa.
Medal Paving Brick Company
Cleveland, Ohio.
Metropolis Paving Brick Co.
Pittsburg, Kansas.

Metropolitan Paving Brick Co.
Canton, Ohio.
Mineral Wells Paving Brick Co.
Mineral Wells, Texas.
Moberly Paving Brick Company
Moberly, Mo.
Murphysboro Paving Brick Co.
Murphysboro, Ill.
Patton Clay Mfg. Company
Patton, Pa.
Peebles Paving Brick Company
Portsmouth, Ohio
Pittsburgh Paving Brick Company
Pittsburgh, Kansas.
Purington Paving Brick Company
Galesburg, Ill.
Southern Clay Mfg. Company
Chattanooga, Tenn.
Springfield Paving Brick Company
Springfield, Ill.

Sterling Brick Company
Olean, N. Y.
Streator Clay Mfg. Company
Streator, Ill.
Thornton Fire Brick Company
Clarksburg, W. Va.
Thurber Brick Company
Ft. Worth, Texas.
Toronto Fire Clay Company
Toronto, Ohio
Trinidad Brick & Tile Company
Trinidad, Colo.
Veedersburg Paver Company
Veedersburg, Ind.
Western Shale Products Company
Fort Scott, Kans.
Westport Paving Brick Company
Baltimore, Md.

The solid, substantial character of **COLLIER SERVICE** has placed it high among those permanent organizations recognized as National Institutions

Barron G. Collier
INCORPORATED

Read the Answer On the Cars

ALL over this broad land thousands of car journals are turning gratefully on a thin but adequate film of Texaco Car Oil. Hundreds of millions of car miles on Texaco—and more as roads renew their contracts and additional roads come to Texaco.

That record is better than anything we can say here.

But better yet is the record of reduced maintenance that follows the introduction of Texaco Car Oils.

Intelligent operating men have come to learn *there* is the place to look for results.

Texaco Lubrication Engineers, with their helpful co-operation, are showing them just how much—or rather how little Texaco Car Oil is needed and they are, from their widespread experience, exchanging ideas as to the best methods of application.

RESULTS—

ECONOMY, HARMONY, CONTINUED USE OF TEXACO CAR OILS.

Texaco Car Oils are made in two grades:

Texaco Car Oil—Summer
Texaco Car Oil—Winter

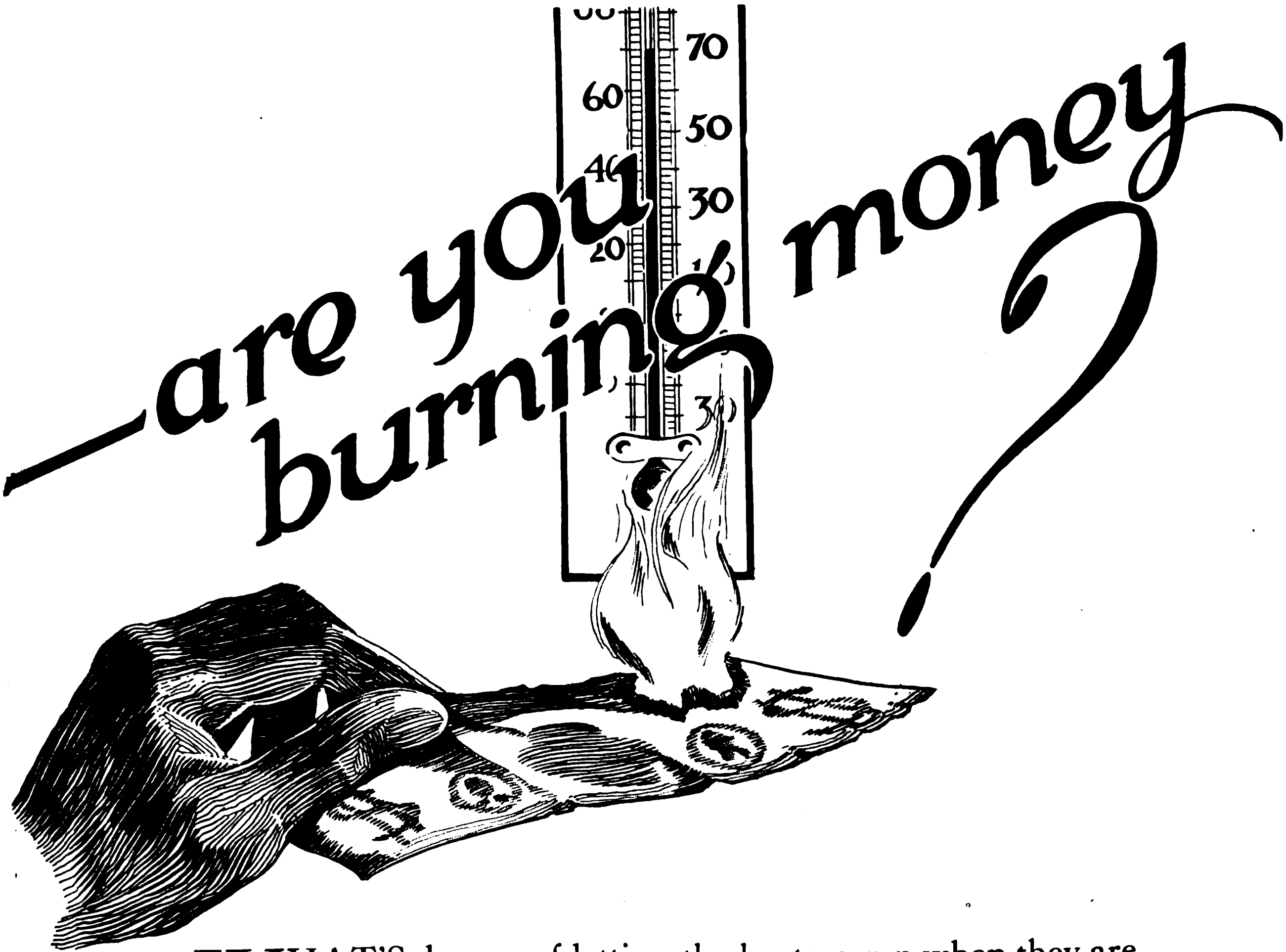
They will take care of all temperature and operating conditions.

On the basis of the excellence of Texaco Car Oils we are securing and holding business; for these oils are important enough to make any road come to Texaco. And, in addition to the savings that are brought about by Texaco Car Oils, roads find additional profits in the use of the rest of the Texaco Line.

There is a Texaco Lubricant for every Street Railway purpose. You will like them all after you use them. And you will like the way Texaco Engineers go about co-operating with your men for improvement of lubricating conditions all along the line.

TEXACO

THE TEXAS COMPANY
DEPT·R-J·17 BATTERY PLACE·NEW YORK CITY
HOUSTON · CHICAGO · NEW YORK
OFFICES IN PRINCIPAL CITIES



WHAT'S the use of letting the heaters run when they are not needed? When somebody merely opens a door or window to cool off, and then there's a call for more heat.

Current means coal and coal means cash.

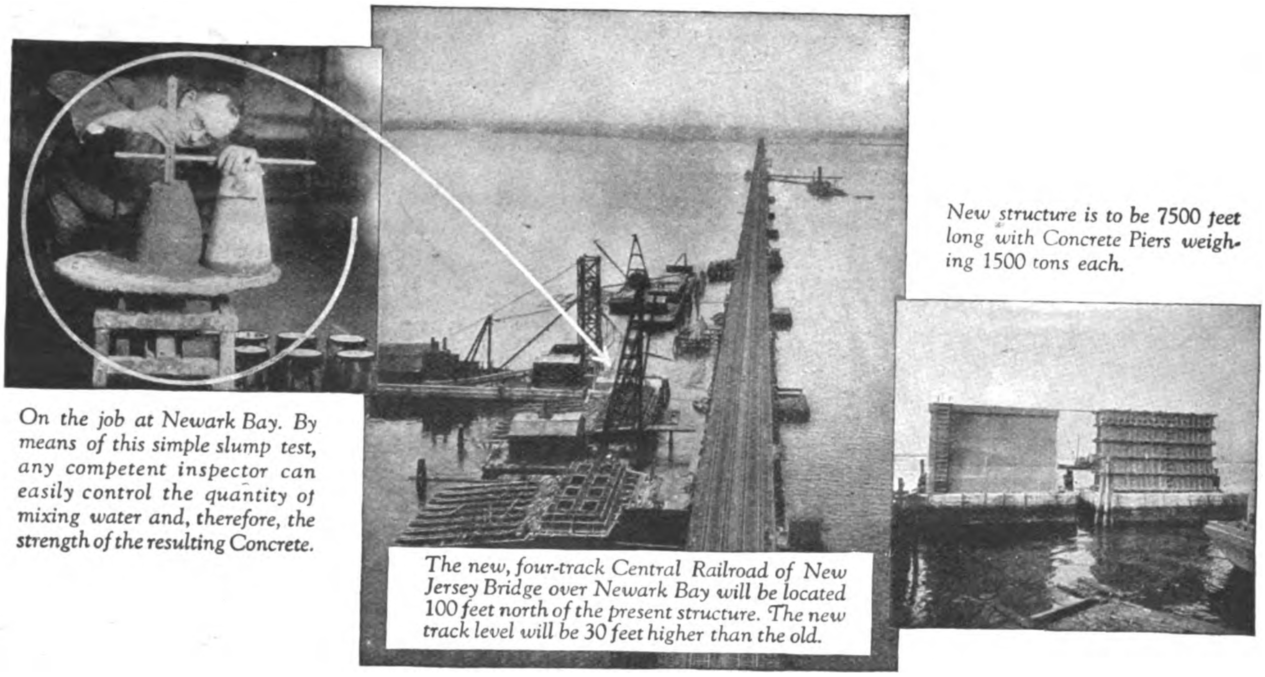
Control Electric Car Heaters and save cash with CONSOLIDATED New Visible Thermostat

Adequately protected, yet entirely visible. Eliminates failures through malicious injury or tampering with thermostat equipment. Inspection time reduced to a glance.

"Keeps nothing under cover"

Write for information on the visible thermostat and new simplified and compact magnetic switch.

Consolidated Car Heating Co.
Albany New York Chicago



On the job at Newark Bay. By means of this simple slump test, any competent inspector can easily control the quantity of mixing water and, therefore, the strength of the resulting Concrete.

The new, four-track Central Railroad of New Jersey Bridge over Newark Bay will be located 100 feet north of the present structure. The new track level will be 30 feet higher than the old.

New structure is to be 7500 feet long with Concrete Piers weighing 1500 tons each.

Quality Control in the Field

Central Railroad of New Jersey engineers believe in putting the laboratory to work right on the job.

In the Concrete construction, shown above, they are regularly applying approved methods of field control to keep the quality of the Concrete uniform and particularly to maintain desired strength.

Strengths are verified at regular intervals by testing field cylinders.

Proportions of fine and coarse aggregates are accurately determined by fineness modulus.

Slump tests are being made daily to control consistency.

This is only one of many jobs where the most modern field methods of control are directly helping to assure better Concrete with greatest economy.

* * *

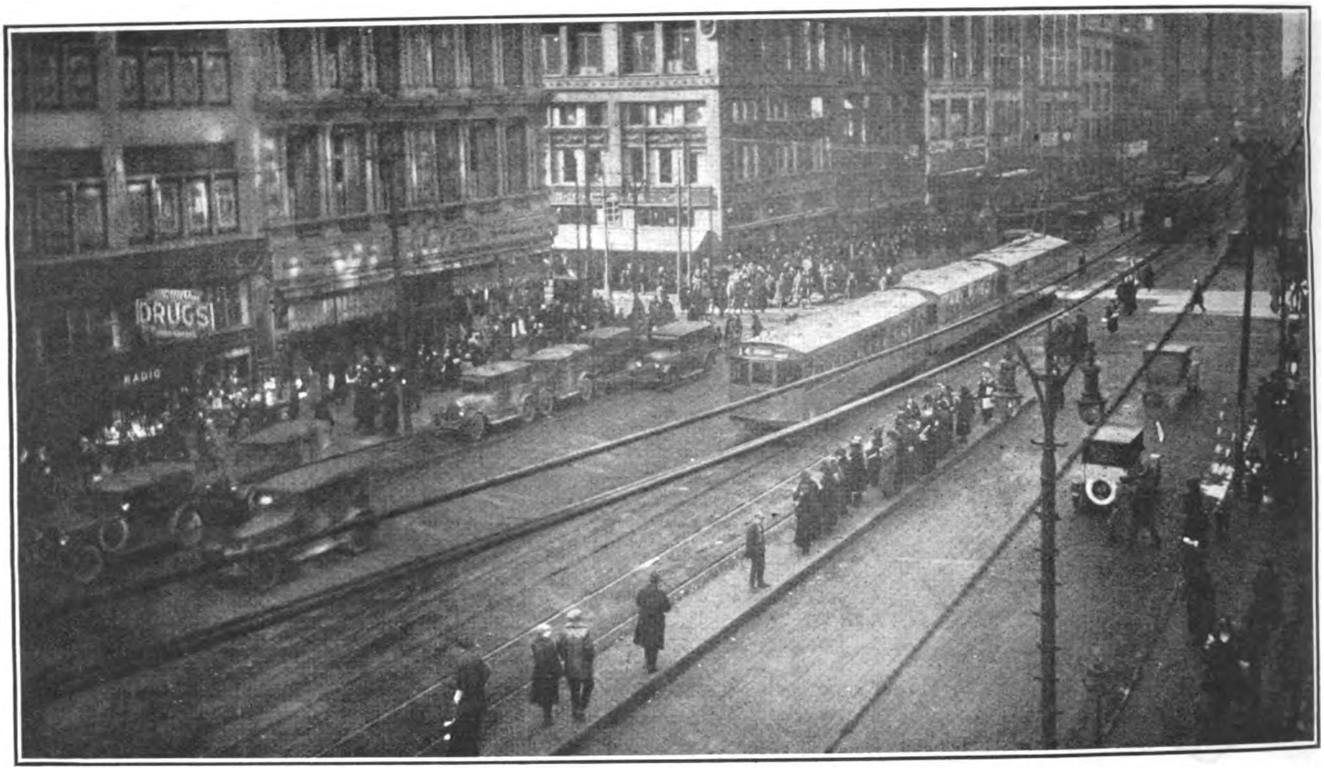
The work on the Newark Bay Bridge is being done under the direction of A. E. Owen, Chief Engineer, J. J. Yates, Bridge Engineer, and H. E. Van Ness, Construction Engineer, Central Railroad of New Jersey.

Let us tell you more about the practical advantages of field methods of quality control. Write the nearest office listed below for your free copy of "Concrete Data for Engineers and Architects."

PORTLAND CEMENT ASSOCIATION

A National Organization to Improve and Extend the Uses of Concrete

Atlanta
Birmingham
Boston
Charlotte, N. C.
Chicago
Dallas
Denver
Des Moines
Detroit
Helena
Indianapolis
Jacksonville
Kansas City
Los Angeles
Memphis
Milwaukee
Minneapolis
New Orleans
New York
Oklahoma City
Parkersburg
Philadelphia
Pittsburgh
Portland, Oreg.
Salt Lake City
San Francisco
Seattle
St. Louis
Vancouver, B.C.
Washington, D.C.



The unique three-car articulated train for the

City of Detroit

These cars include many of the latest developments in equipment, including for their *fending equipment* the dependable, rugged and always-safe H. B. LIFE GUARDS.

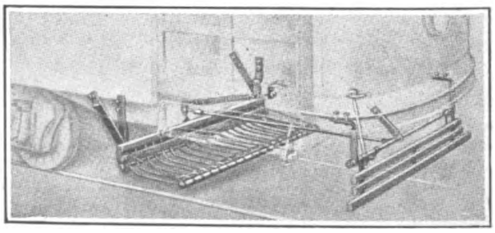
We manufacture fending equipments up to a standard calling for the component parts to be of the best, strong and rigid to withstand service conditions, quick-acting, efficient and low in maintenance cost.

Our years of experience in building these equipments qualify us to know that to cheapen a guard weakens it.

To get what years of experience have taught us under all conditions to be the best —

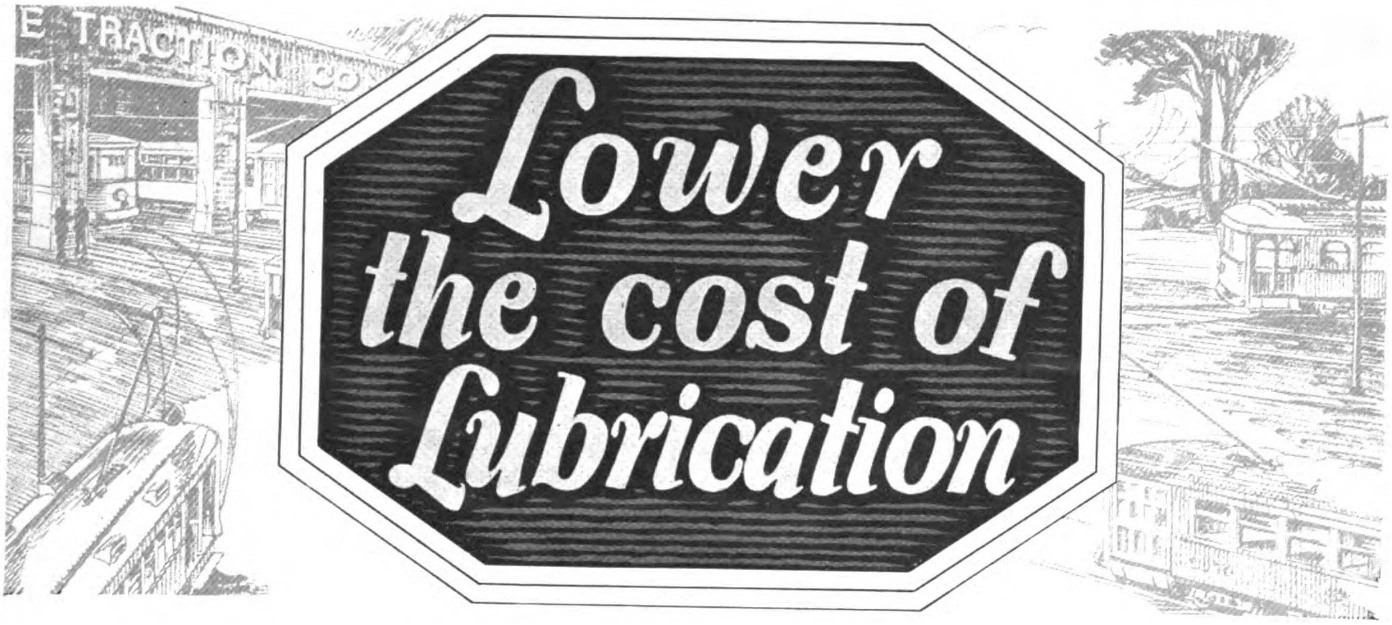
Specify
"To Be Manufactured By the Consolidated Car Fender Co."

WENDELL & MacDUFFIE CO., 110 East 42d St., New York
General Sales Agents



H. B.

LIFE GUARDS



WHEN you set out to lower your operating costs, consider the reductions you can make by lubricating all of your equipment properly with Standard Oils and Greases.

The proper use of these lubricants will minimize bearing failures, and eliminate pull-ins. It will reduce labor costs by extending time between oiling periods.

The purchase price of these oils and greases represent only 2% or 3% of your total maintenance cost, yet this cost may be substantially reduced by taking advantage of the superior service they render.

Records in our files prove these figures.

An Indiana Traction Company, following the recommendations of our engineering staff, reduced the cost of lubricating their equipment 50%.

Another Company, located in Michigan, after a six months' trial, during which they were guaranteed that their costs would not increase, effected a saving of 30%.

The reductions in lubricating costs which these companies enjoy are typical of the service rendered by Standard Lubrication Engineers and Standard Lubricants. They indicate the possibility of reducing your own maintenance costs.

The first step toward making these reductions practical is to write to our nearest branch requesting the service of a Standard Lubricating Engineer. The report he will make after studying your lubricating requirements will put you under no obligation except to yourself, for it will point out the way for you to lower lubricating costs.

STANDARD OIL COMPANY
(INDIANA)
910 S. Michigan Avenue CHICAGO, ILLINOIS

ILLINOIS
Chicago
Decatur
Joliet
Peoria
Quincy

INDIANA
Evansville
Indianapolis
South Bend
KANSAS
Wichita

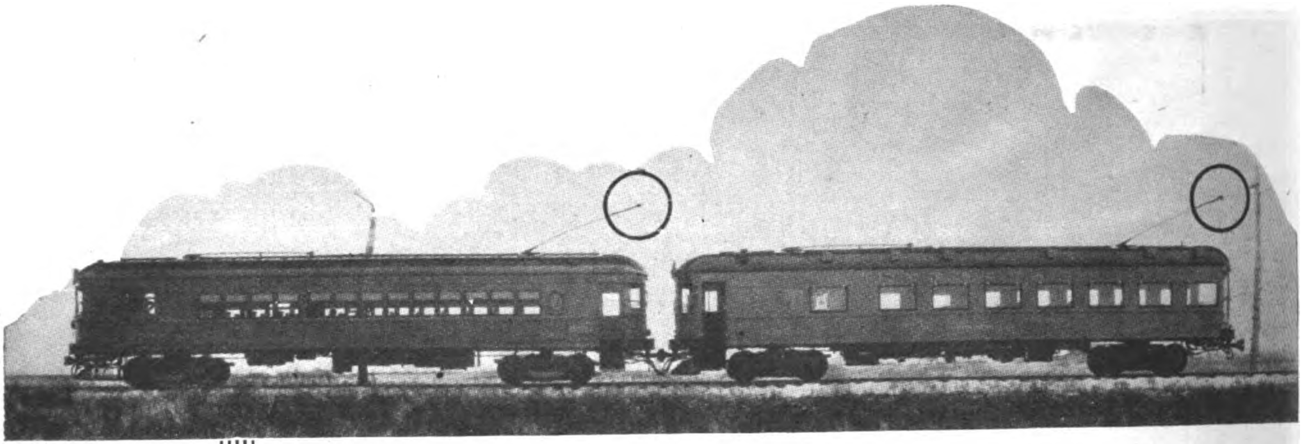
IOWA
Davenport
Des Moines
Mason City
Sioux City

S. DAKOTA
Huron
MICHIGAN
Detroit
Grand Rapids
Saginaw

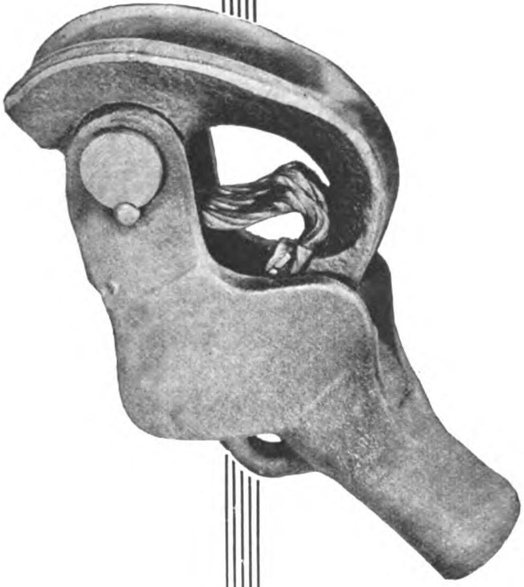
N. DAKOTA
Fargo
Minot
WISCONSIN
La Crosse
Milwaukee

MINNESOTA
Duluth
Mankato
Minneapolis

MISSOURI
Kansas City
St. Joseph
St. Louis



Of course they are—

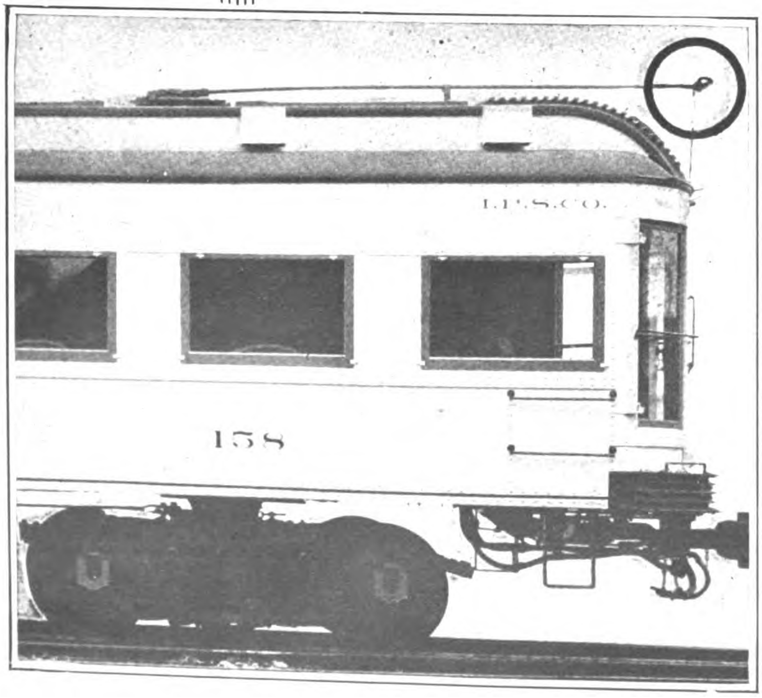


MILLER
TROLLEY
SHOES
(patented)

On the Interstate Public Service Company's Cars

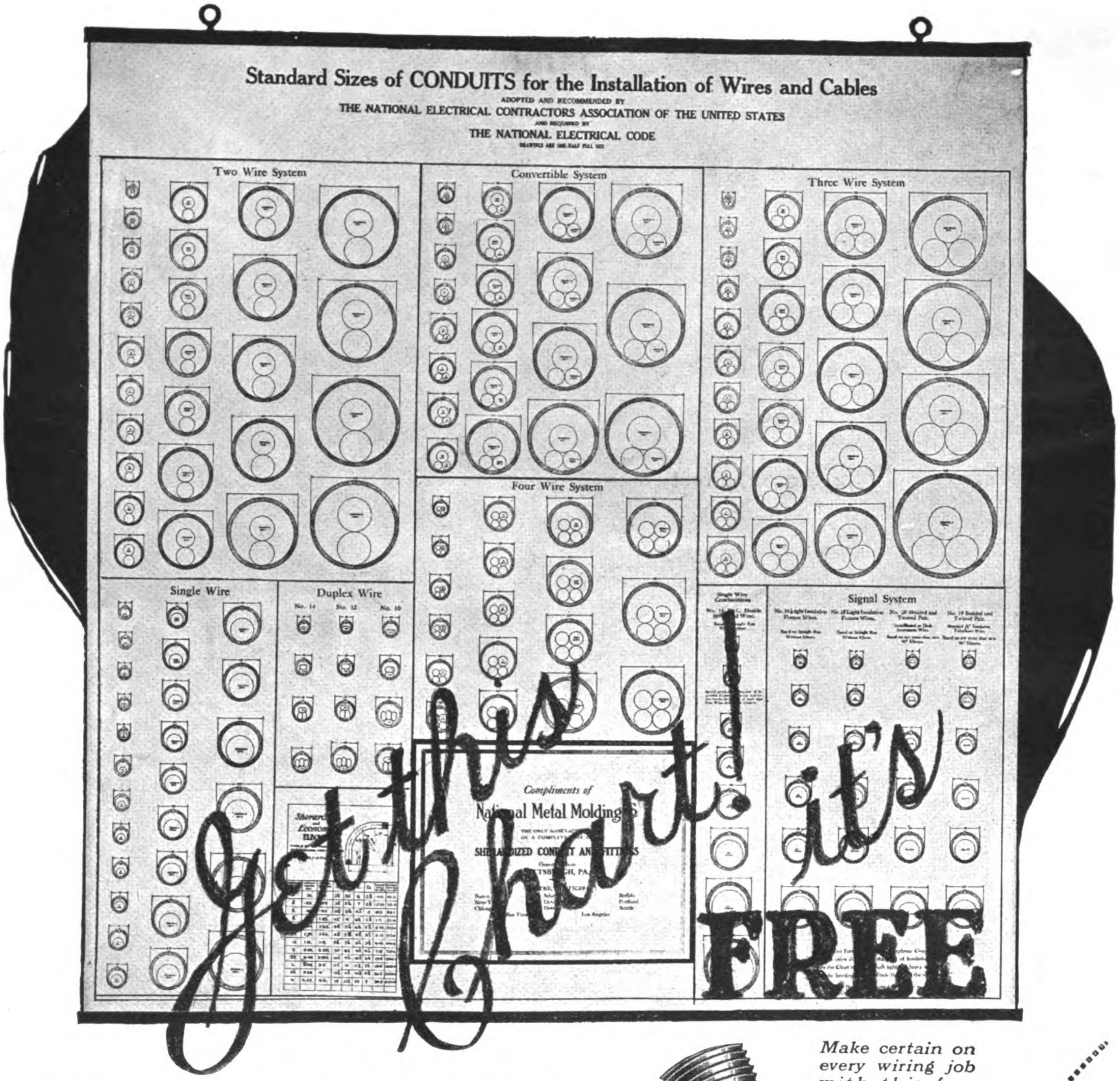
Big cars, fast cars, luxurious cars—they're also quiet-riding cars. That disagreeable hum and vibration so commonly experienced on cars where trolley wheels are used is conspicuously absent. Miller Trolley Shoes because of their smooth sliding contact, afford noiseless operation.

Officials of this prominent interurban agree with many other railway operators in reporting that Miller Trolley Shoes give rise to fewer dewirements and cause no more wear on trolley wire than wheels.



Increased mileage
No lubrication
No bushings

Miller Trolley Shoe
Company
295 Columbia Road, Boston-21, Mass.


Standard Sizes of CONDUITS for the Installation of Wires and Cables
ADOPTED AND RECOMMENDED BY
THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION OF THE UNITED STATES
AND REQUIRED BY
THE NATIONAL ELECTRICAL CODE
Two Wire System
Convertible System
Three Wire System
Four Wire System
Single Wire
Duplex Wire
Signal System
Compliments of
National Metal Moldings
Get this Chart!
it's
FREE

WHAT size of conduit? What about elbows? Questions instantly and authoritatively settled for any job where rigid conduit is to be installed.

This Chart hangs on the wall as handy as a calendar—and as necessary when wiring must be figured.

It is a quiet reminder of *Sherarduct*—the Rigid Conduit. The Chart is free, and so intensely practical you will regularly use it.

National Metal Molding Company

NATIONAL PRODUCTS

WORLD'S LARGEST PRODUCERS OF ELECTRICAL
CONDUITS AND FITTINGS

1149 Fulton Building, Pittsburgh, Pa.

10

Represented in All Principal Cities

Sherarduct

The Rigid Conduit That Bends

Make certain on every wiring job with this free Chart. Just slip this coupon in the mail now; that's all you need to do.

SHERARDUCT

MAIL TODAY

SIGN—TEAR OFF

**National
Metal Molding
Company
Pittsburgh, Pa.**

Please send free Chart of
Standard Sizes of Conduits.

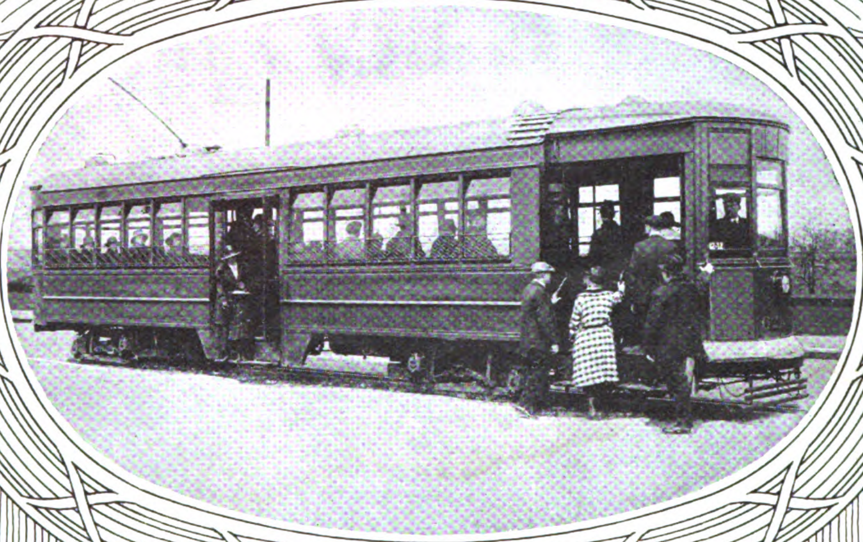
Name

Firm

Address

PANTASOTE
TRADE MARK

AGASOTE
TRADE MARK

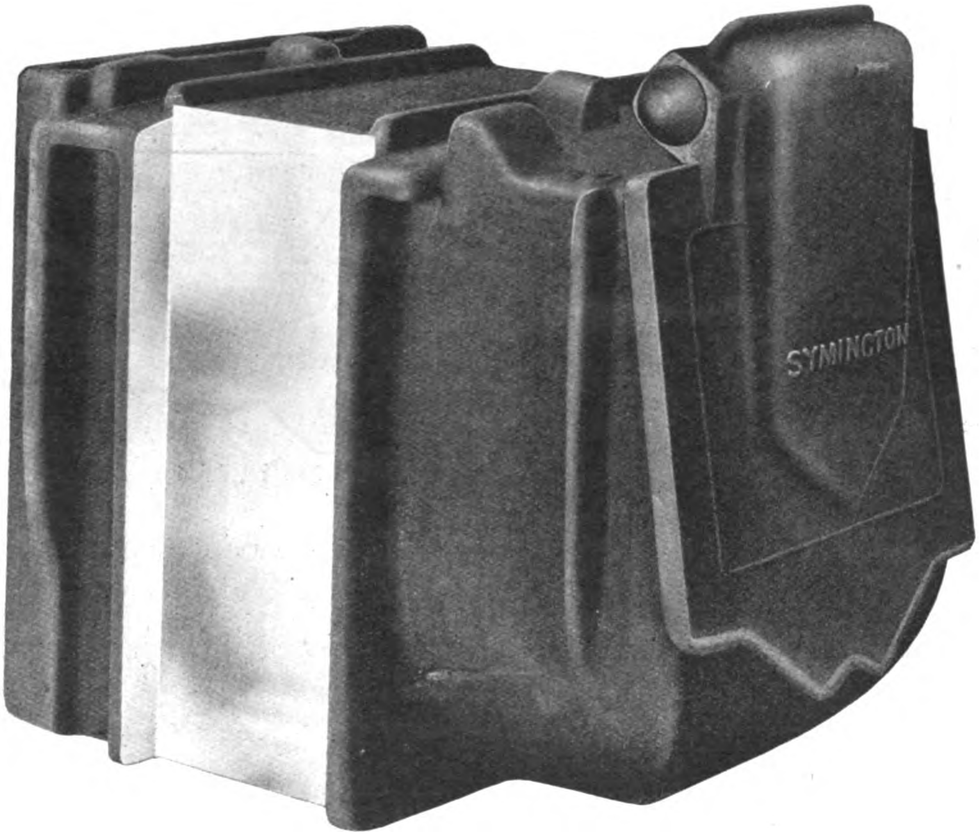


Standard for Electric Railways

THE PANTASOTE COMPANY, Inc.
NEW YORK CHICAGO SAN FRANCISCO

SYMINGTON

SEMI-STEEL JOURNAL BOXES



An Easy Demonstration

HAND file a few strokes on the machined pedestal ways of a Symington Semi-Steel Journal Box.

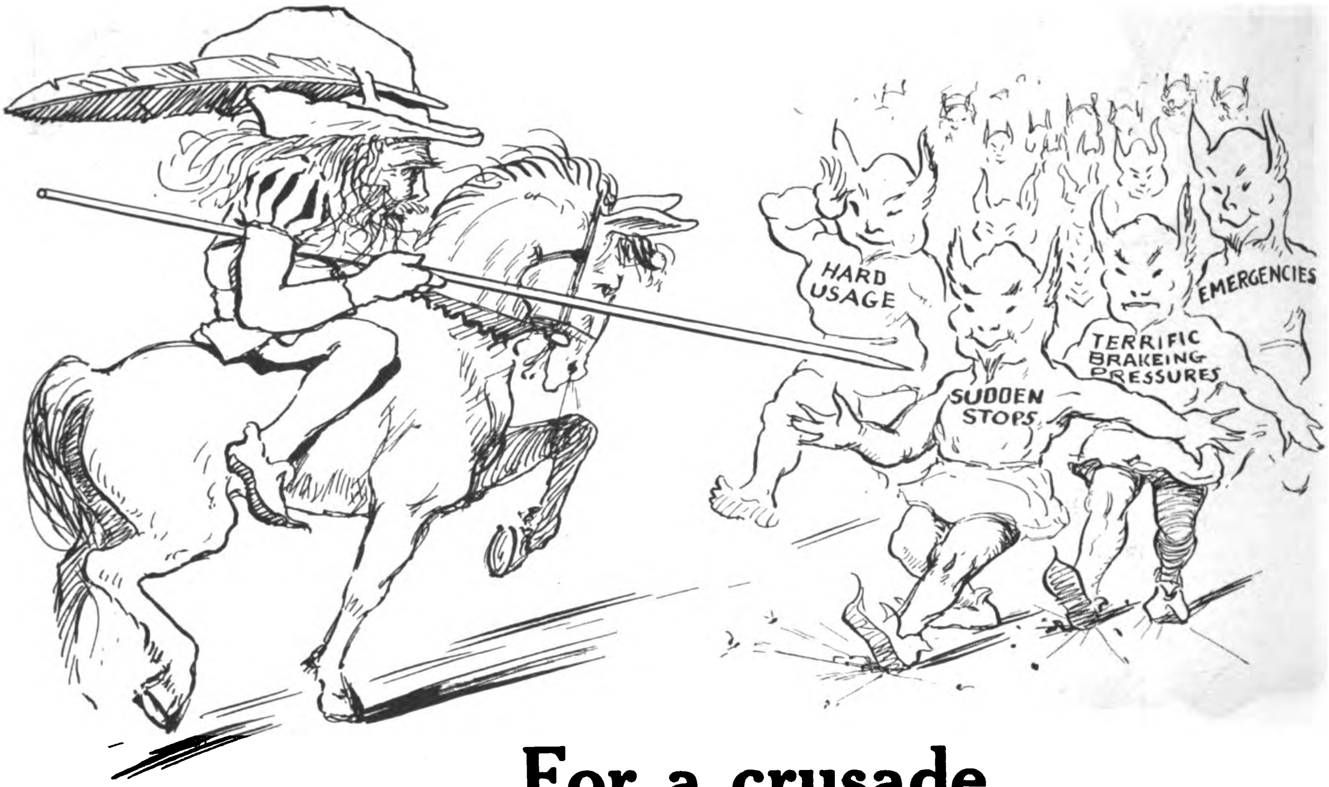
The tough, wear-resisting quality of *semi-steel* instantly demonstrates itself.

This ability gives to Symington Semi-Steel Pedestal Type Journal Boxes their long useful life and economy of maintenance and operation.

THE T. H. SYMINGTON COMPANY

New York Chicago Baltimore Boston Montreal

WORKS: ROCHESTER, N. Y.



For a crusade against high maintenance

BOYERIZE!

Even the trusty steel of olden times couldn't stand up to the strains of a brake rigging job on city cars.

Only specially hardened steel can live at all. Only Boyerized steel with its glossy armor plate surface can give full service and protection.

Experience has proved that it actually outwears case-hardened steel three to four times.

Choose from the long wear line

It's Boyerized!

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrums

Center Bearings
Side Bearings
Spring Post Bushings
Spring Posts
Bolster and Transom
Chafing Plates

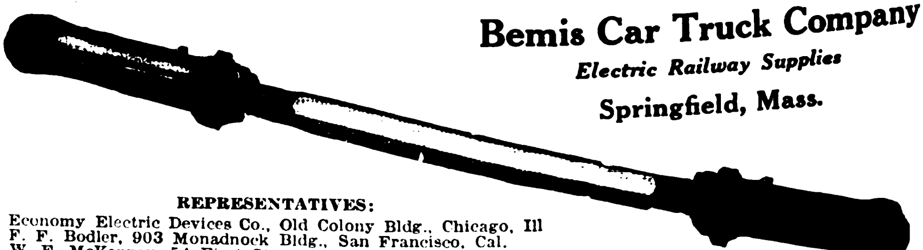
McArthur Turnbuckles
Manganese Brake Heads
Manganese Truck Parts
Bushings
Bronze Bearings

The McArthur Turnbuckle

You won't have to refit the rigging with new turnbuckles, if you specify McArthur Turnbuckles in the first place. They will last as long as the truck itself.

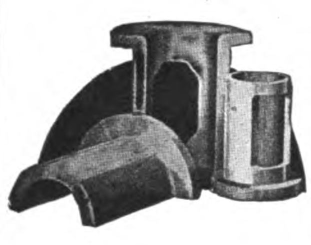
More than that—the old-style jam-nut idea has been scrapped, and an efficient spring-equipped, split-clamp principle has been substituted. Now it only takes a pocket-wrench and a moment's time to make an adjustment, and tighten it up to stay.

Full details on request. Let us quote you



Bemis Car Truck Company
Electric Railway Supplies
Springfield, Mass.

REPRESENTATIVES:
Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Oregon
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.

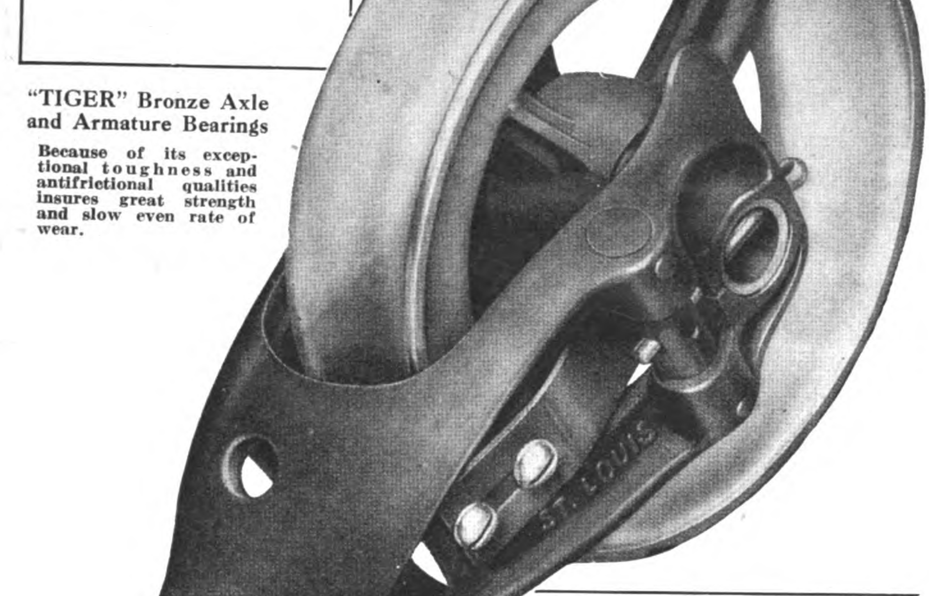


"TIGER" Bronze Axle and Armature Bearings

Because of its exceptional toughness and antifrictional qualities insures great strength and slow even rate of wear.

Today's equipment—tomorrow's service

V-K



Oil-less Trolley Wheels and Non-Arcing Harps

The equipment used on street cars today unfailingly determines the service condition of those cars tomorrow. It assures rendering good, appreciable service or invites trouble. It determines to what extent maintenance economy is possible. Today they are coming to More-Jones for V-K Oil-less trolley wheels and non-arcing harps, for superiority in design and for correctness of materials used in construction. They insure tomorrow's service.

MORE-JONES B&M CO'S ARMATURE
ST. LOUIS MO.

M-J Armature Babbit

Saves repairs, labor and replacement expense. Contains no lead. Standard on a majority of electric railways because it insures the lowest net cost per mile.

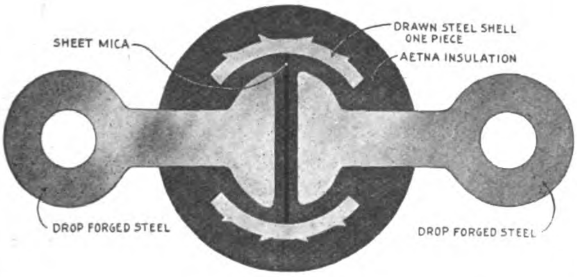
We have for years studied electric railway problems and in developing our various products have sought and successfully brought out the features that mean most in equipment and economical car operation.

We will gladly go into the matter of our products, (best for any street car service), with those so desiring. You are assured of uniformity and dependability in More-Jones products. Prompt shipments.

More-Jones Brass & Metal Co., St. Louis Mo.

MORE-JONES QUALITY PRODUCTS

TRADE **ANDERSON** MARK



STRENGTH

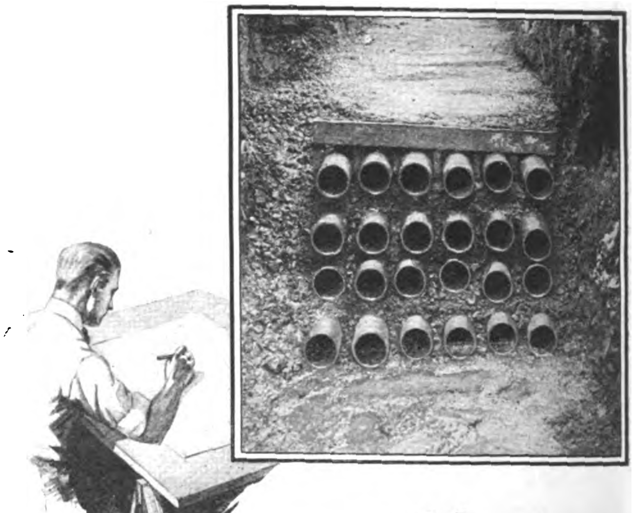
The great tensile and electrical strength of Anderson Elephant Strain Insulators will be seen by the above cross-section. A one-piece spherical steel shell is pressed around the steel terminals, which are so shaped that the strain is equally distributed, utilizing the whole strength of the metal parts.

Elephant Strain Insulators

Sheet mica is placed between the terminals and Aetna Insulation is moulded around the body under heavy hydraulic pressure. This Insulator is as strong electrically and mechanically as its name implies. Diameter of bodies 2½ in. x 3⅝ in., inside diameter of eyes 9/16 in. x 1 in.

Albert & J. M. Anderson Mfg. Co.
289-305 A St., Boston, Mass.
BRANCHES:
New York, 135 Broadway; Philadelphia, Broad and Chestnut Sts., Chicago, 105 So. Dearborn St., London, 12 Moor Lane, E. C. 2.

Plan ahead~



with

ORANGEBURG
FIBRE CONDUIT

CHOOSE ORANGEBURG FIBRE CONDUIT encased in monolithic concrete for permanency in your duct lines.

Wisely planned, with adequate provision for the future, it gives you the maximum of protection and insurance against interruption.

Ten or twenty years from now your cables will be found intact and the "spares" in first class condition to provide for expansion.

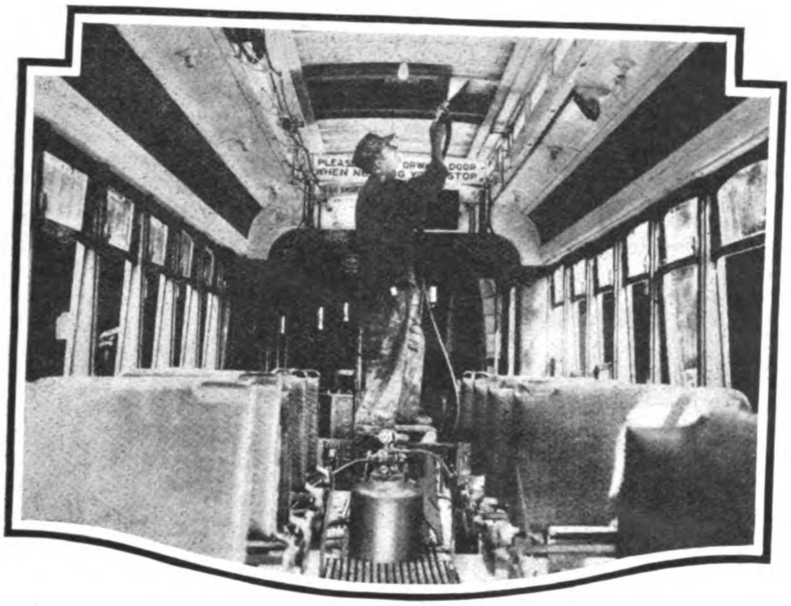
THE FIBRE CONDUIT CO. ORANGEBURG, N.Y. REG. U.S. PAT. OFF. ORANGEBURG

Electrical Materials for Utilities Jobber Contractor and Dealer

JOHNS-MANVILLE, Inc.
292 Madison Avenue at 41st Street
New York City
Branches in 62 Large Cities
For Canada
CANADIAN JOHNS-MANVILLE CO., Ltd.
Toronto

JOHNS-MANVILLE
Sole Selling Agent

"Repainting Done Inside and Out for $125. per Double-Truck Car"



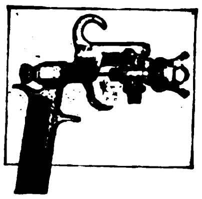
Says the Eastern Massachusetts St. Ry. Co. of Boston.

Quoting further from letter received from the Superintendent of Rolling Stock and Equipment, of this large New England property: "Our company has used the DeVilbiss Spray System of painting for two years. We have by this method been able to reduce our cost of painting very materially * * * and are in a position to paint our rolling stock at shorter intervals."

Improvement in quality of work—saving of time—lowered labor costs, are noteworthy advantages made possible by the DeVilbiss Spray-painting System on electric railway car and equipment painting.

Let us work with you. Interesting operation and equipment facts will be gladly mailed. Address—

THE DeVILBISS MFG. CO.
272 Phillips Ave. TOLEDO, OHIO



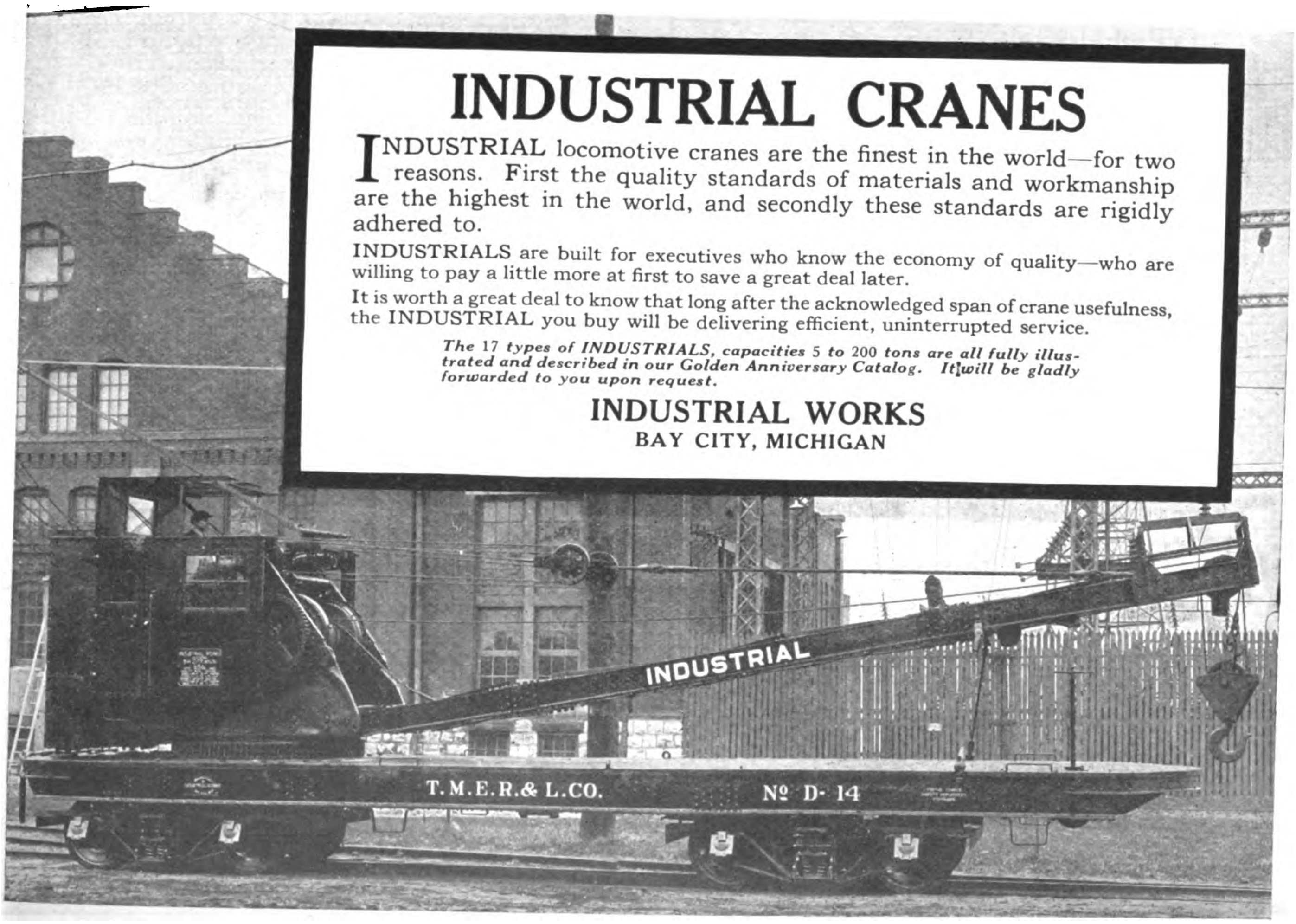
New DeVilbiss Spray Gun

This latest DeVilbiss development provides for the most advantageous application of any paint or varnish material. It embraces 17 important, distinctive features, among which are a "Self-centering nozzle," a "Quick detachable spray head," "All parts interchangeable," "Simplicity of design," and "One model for all purposes."

This new Type "A" Spray Gun insures the utmost in spray gun value and service.

DeVilbiss Spray-painting System

[Complete Equipment for Every Painting Requirement]



INDUSTRIAL CRANES

INDUSTRIAL locomotive cranes are the finest in the world—for two reasons. First the quality standards of materials and workmanship are the highest in the world, and secondly these standards are rigidly adhered to.

INDUSTRIALS are built for executives who know the economy of quality—who are willing to pay a little more at first to save a great deal later.

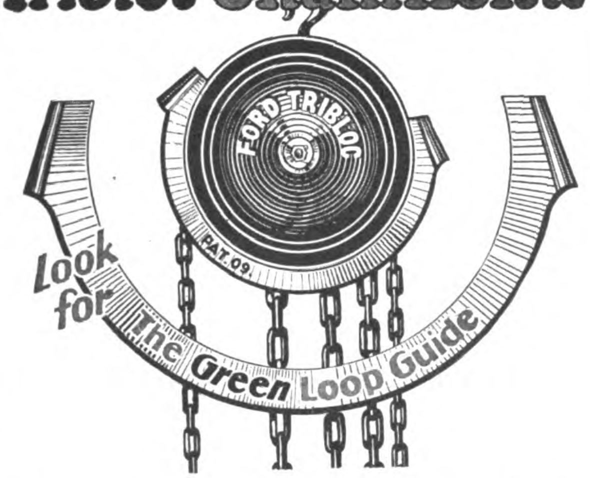
It is worth a great deal to know that long after the acknowledged span of crane usefulness, the INDUSTRIAL you buy will be delivering efficient, uninterrupted service.

The 17 types of INDUSTRIALS, capacities 5 to 200 tons are all fully illustrated and described in our Golden Anniversary Catalog. It will be gladly forwarded to you upon request.

INDUSTRIAL WORKS
BAY CITY, MICHIGAN

FORD

Tribloc Chain Hoists

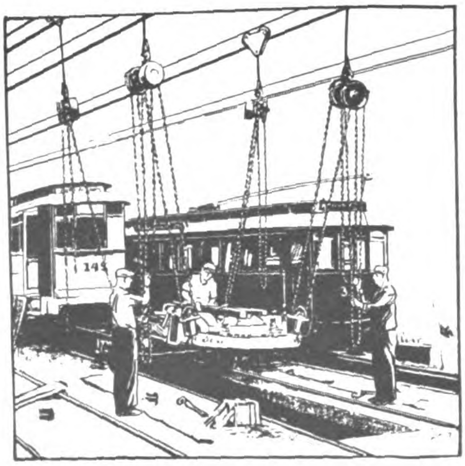

FORD TRIBLOC
PAT. 09
Look for The Green Loop Guide

THE *Green* Loop Guide is the mark of a good chain hoist. Good because of the high efficiency of its planetary gearing; because of its Patented Loop Hand Chain Guide which protects the hoist and controls the hand chain at all speeds of travel; because of its rugged construction throughout.

Ford Triblocs have 80% efficiency; an eighty-pound pull of one man on the hand chain of a 1-Ton Tribloc will lift a ton. Strong and compact. Made entirely of malleable iron and steel, except the Hand Chain Wheel, which is gray iron. Capacities from ¼ to 20 tons.

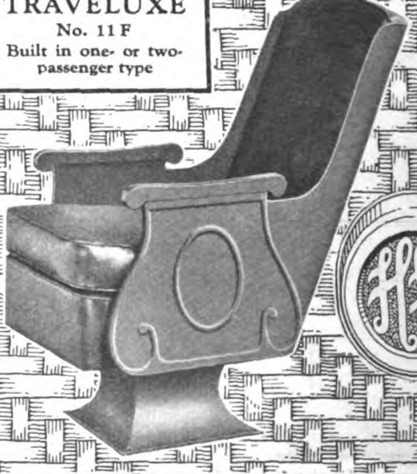
Write for Catalog 6B

FORD CHAIN BLOCK COMPANY
2nd and Diamond Sts., Philadelphia, Pa.
Overseas Representative: Allied Machinery Co. of America
90 Wall St., New York, N. Y.



Comfort the Keynote of This H-W Coach Seat

TRAVELUXE
No. 11 F
Built in one- or two-passenger type



NOTHING approaching the "Traveluxe in motor coach comfort has ever before been achieved.

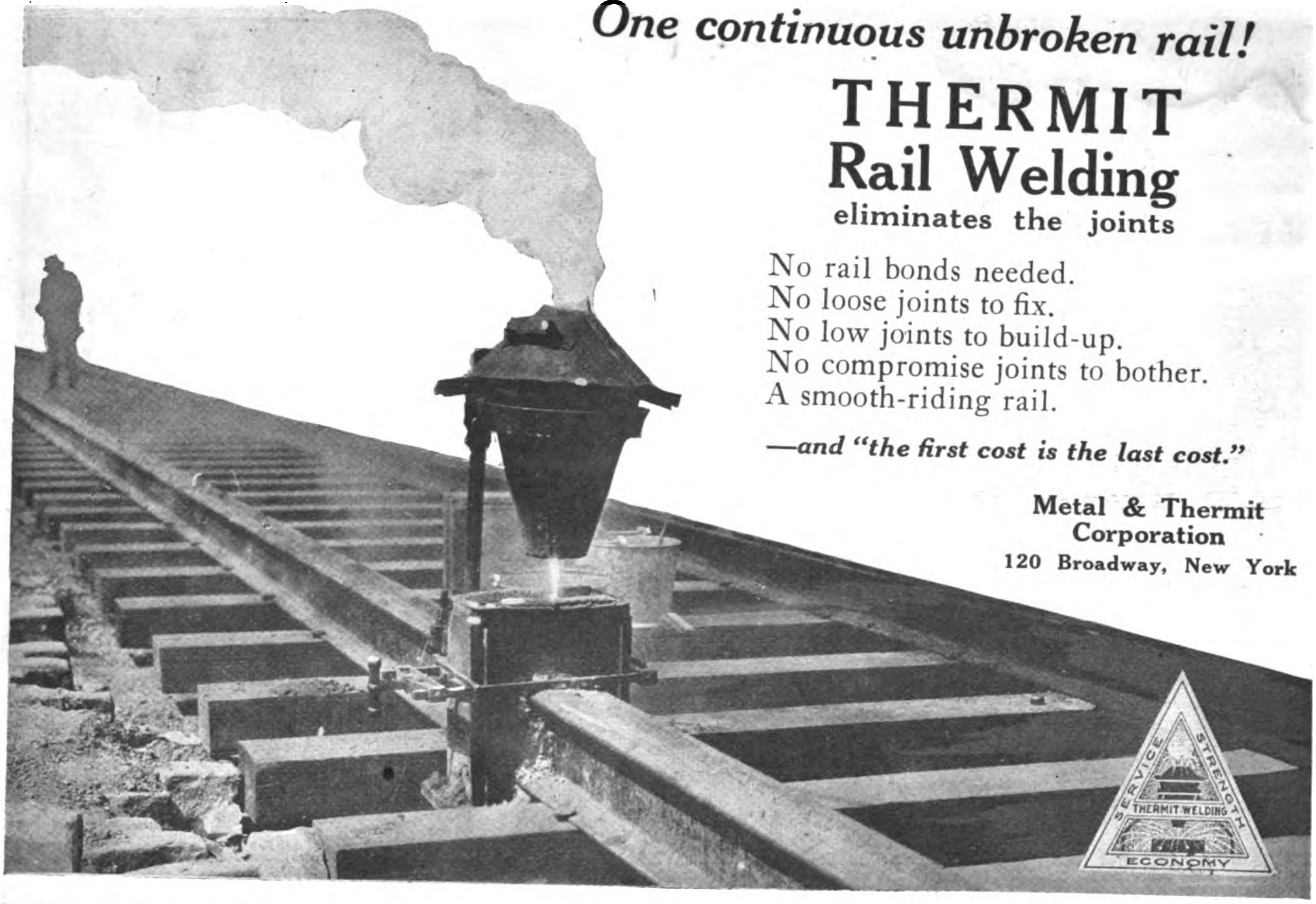
Back is overstuffed with curled hair. A cushion of "comfy" springs and curled hair rests upon a 7-inch coil-spring construction. Correctly pitched frame and wide-flanged base are of pressed steel. These exclusive H-W features impart to the "Traveluxe" those touches of travel luxury long sought for distance motor bus travel.

The Heywood-Wakefield line, representing 98 years of seat-building experience, furnishes special models for every kind of passenger service from the exclusive "Traveluxe" to the Yellow Coach and Fifth Avenue Coach Company types for city use.

Seating experts are available to you, without cost, through any of our sales offices.

HEYWOOD-WAKEFIELD SALES OFFICES
HEYWOOD-WAKEFIELD CO.
1415 So. Michigan Ave., Chicago, Ill.
HEYWOOD-WAKEFIELD CO.
516 W. 34th St., New York
Monadnock Bldg., San Francisco
F. N. GRIGG
630 Louisiana Ave., Washington, D. C.
THE G. F. COTTER SUPPLY CO.
Houston, Tex.
THE RAILWAY AND POWER ENGINEERING CORP'N
Montreal and Toronto, Canada

Heywood-Wakefield
REG. U.S. PAT. OFF.



One continuous unbroken rail!

THERMIT
Rail Welding
eliminates the joints

No rail bonds needed.
No loose joints to fix.
No low joints to build-up.
No compromise joints to bother.
A smooth-riding rail.

—*and "the first cost is the last cost."*

Metal & Thermit Corporation
120 Broadway, New York

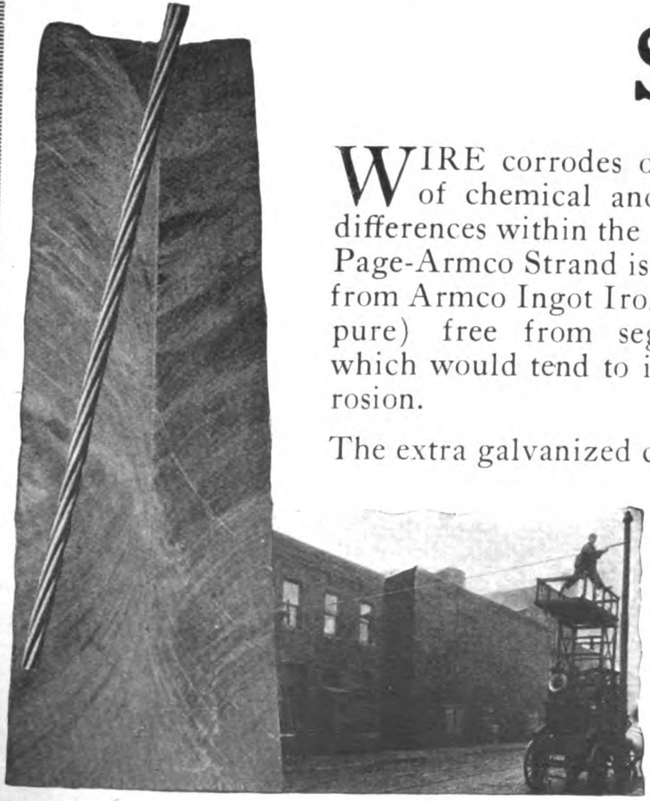
SERVICE STRENGTH ECONOMY THERMIT WELDING

PAGE-ARMCO
STRAND

WIRE corrodes on account of chemical and physical differences within the metal. Page-Armco Strand is produced from Armco Ingot Iron (99.84% pure) free from segregations which would tend to invite corrosion.

The extra galvanized coating on Page-Armco Strand combined with the purity of the wire insures maximum service.

Page-Armco Iron Strand is used as messenger strand, guy wire or strand, telephone wire or strand, trolley span wire, ground wire or strand, telegraph wire and as power transmission conductors.



PAGE STEEL AND WIRE COMPANY
An Associate Company of the American Chain Co., Inc.
Bridgeport, Conn.

DISTRICT SALES OFFICES:
Chicago New York Pittsburgh San Francisco

MANUFACTURERS OF:
Rods—Armco Ingot Iron and Special Analysis Steels.
Wire—Plain and Galvanized—Rope, Telephone, Telegraph, Bond, Strand, Gas and Electric Welding Wire.
Fence—Woven Wire for Farm and Railway Right of Way, Hi-way Guard, Wire Link Protection for Industrial Plants, Lawns, Schools and Estates, and Factory Partitions.

STEEL AND WIRE PAGE QUALITY PRODUCTS

ARMCO INGOT IRON

Put STEINMETZ in *Your* Library—

THE nine volumes which Dr. Steinmetz has contributed on the subject of electrical engineering are now available in a handsome specially bound set. To those who know what these great books have meant in the development of electrical engineering theory and practice—this announcement needs no elaboration. The Steinmetz books have been called the foundation of electrical practice. Their recognition is worldwide. In Europe, Japan, South America—in every corner of the globe—they are accepted standards and guides.

Have this handsome set with its full treatment of the theory and special problems of electrical engineering at your command. The handbook and the practical treatise may give you the simple fact you need—but Steinmetz gives you the theory and its application—the real solution of the problem.

See these books for 10 days FREE

You can examine the STEINMETZ ELECTRICAL ENGINEERING LIBRARY for ten days free. Simply fill in and mail the coupon below. This will not obligate you to purchase. You merely agree to return the books, postpaid, in ten days, or to remit $4.00 in ten days and $4.00 per month for eight months. Take this opportunity to see for yourself what these books are and how useful they could be to you. Remember that they are the latest revisions of the Steinmetz books in a handsome specially bound library edition at a price a little less than the regular editions of the books.

McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

You may send me on approval for 10 days' free examination, the STEINMETZ ELECTRICAL ENGINEERING LIBRARY. I agree to return the books, postpaid, in 10 days or to remit $4.00 in 10 days and $4.00 per month for eight months.

Name ....

Address ....

Official Position ....

Name of Company ....

Subscriber to Electric Railway Journal?.....Mem. A.I.E.E.?.....

(Books sent on approval to retail purchasers in U. S. and Canada only.)
E.R.J. 4-19-24

Labor
at 15cts. an hour

What would it cost you to load 250 to 500 yards of dirt piled on a pavement as in the picture? A laborer wouldn't load more than 10 yards a day.

The Universal *Full Circle* Crane owned by the Street Railway loaded it at the rate of 250 yd. a day, far faster than it could be done by hand, and at a cost equal to paying laborers 15c. an hour to do it. The same Universal reduced the size of gangs on most of their other jobs running from one to another to do the heavy work, handling track work, poles, ballast, etc., and digging trench. Being motor-truck mounted it does not delay rail traffic and takes short cuts to jobs.

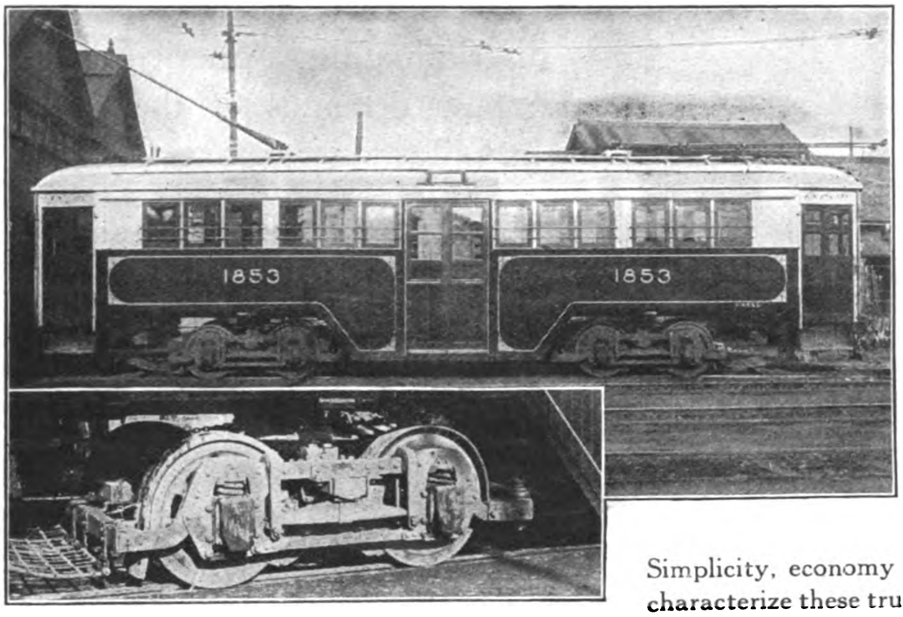
Why are so many Street Railways installing them? It is worth investigating.

Write for Bulletin No. V-22 →

Universal Cranes
for General Construction Work
The Universal Crane Co.
Cleveland, Ohio

THE UNIVERSAL CRANE COMPANY
1122 Swetland Bldg., Cleveland, Ohio

Baldwin Class "L" Trucks, With Equal Size Wheels on Tokyo Municipal Electric Railway Cars



Where the clearance under the car body permits wheels of equal size, Baldwin Class "L" trucks give universal satisfaction in city service. The side frames are of bar steel, arranged with the greater sectional dimension vertical to give maximum strength. The end frames are of angle iron. The motors are outside hung, permitting a short wheel base to be used.

Simplicity, economy and low cost of maintenance characterize these trucks. Full details upon request

Type "L" Trucks on Tokyo Municipal Railway Cars

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U. S. A. Cable Address, "Baldwin, Philadelphia"

1241

T. S. Q

says

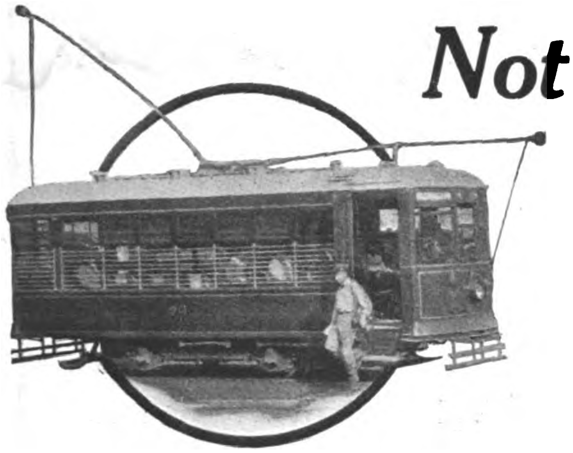
"I save equipment expense."

Tool Steel Quality

**The Tool Steel
Gear and Pinion Co.**

CINCINNATI, O.

Not only more cars—



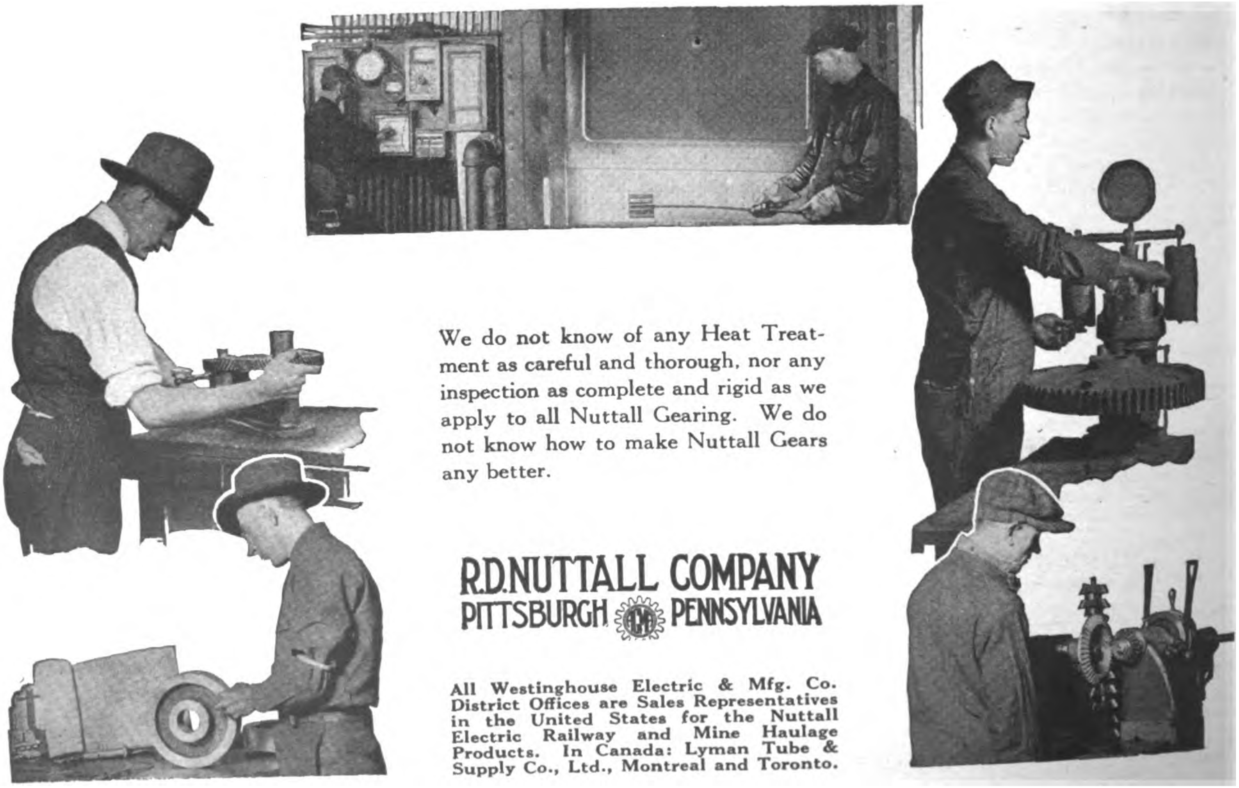
but also better cars. That's what the discriminating American public now demands of their electric railway transportation systems. More frequent service — yes! But they also look for new, modern cars. It doesn't do to temporize with makeshift rebuilt cars of obsolete type.

St. Louis Quality Cars

Embody all the most modern features intended to enhance the safety, comfort and convenience of passengers. Let us figure on your specifications.

St. Louis Car Company, St. Louis, Mo.

"The Birthplace of the Safety Car"



We do not know of any Heat Treatment as careful and thorough, nor any inspection as complete and rigid as we apply to all Nuttall Gearing. We do not know how to make Nuttall Gears any better.

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

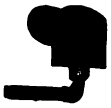
AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

AMELECTRIC. American Electrical Works. Wires and Cables. Phillipsdale, R.I.
Reg. U. S. Pat. Office

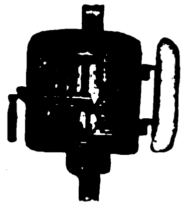
Incandescent Lamp Cord

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams; Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

"AIMCO" CROSSING BELL AND WARNING SIGNAL RED LIGHTS VISIBLE IN BOTH DIRECTIONS



ASPECT CASES WITH RED LIGHTS VISIBLE IN BUT ONE DIRECTION



INTERIOR OF CASE SHOWING OPERATING MECHANISM

Send Today for our new Publication on Safety and Efficiency in Electric Railway Signals and Crossing Bells

AMERICAN INSULATING MACHINERY CO., INC.
521 Huntingdon St., Philadelphia, Pa.

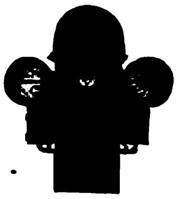
Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000. Wet 31,400. Line 10,000.

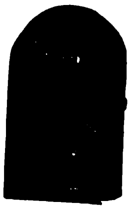
Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1848—Inc. 1870



U. S. ELECTRIC AUTOMATIC SIGNAL
for single track block signal protection
United States Electric Signal Co.
West Newton, Mass.

Chapman Automatic Signals
Charles N. Wood Co., Boston



HUBBARD TURNBUCKLES

Made in three types, Eye and Eye, Eye and Hook and Eye and Clevis.

Type B, Eye and Hook

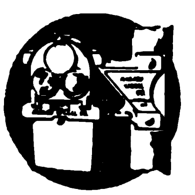
Double-Dip Hot Galvanized the Hubbard Way.

HUBBARD & COMPANY
PITTSBURGH CHICAGO

STANDARD
Wires, Cables, Cable Accessories
Superior quality, economical prices
Standard Underground Cable Co.
Boston Philadelphia Pittsburgh Detroit
New York Washington Chicago St. Louis
San Francisco

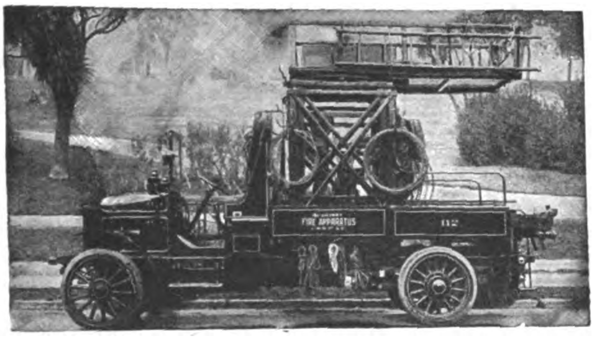
INSULATED WIRES AND CABLES
JOHN A. ROEBLING'S SONS CO., TRENTON, NEW JERSEY

AUTOMATIC SIGNALS
Highway Crossing Bells
Headway Recorders
NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KENTUCKY.



Lapp Insulators
Lapp Insulator Co. Inc. LeRoy, N.Y.
Trade Mark

Shaw Lightning Arresters
Standard in the Electric Industries for 35 years
Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.



TRUCK WITH TOWER IN RUNNING POSITION

TRENTON TOWER

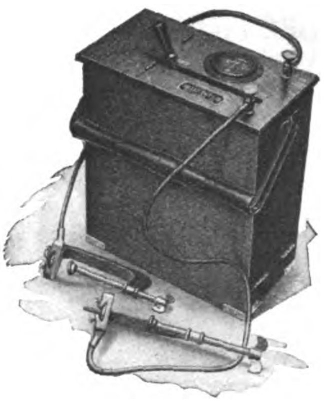
This 3-Section

is not only more convenient, but stronger than the older type.

The top section is reinforced by the intermediate section. The 3-section design makes it possible to raise the platform 16 inches higher and drop it 12 inches lower than can be done with the old-style 2-section tower.

We'll gladly send you details.

J. R. McCARDELL CO.
Trenton, New Jersey, U. S. A.



Portable Storage Battery Equipment

FOR BOND TESTING

Bulletin G-201 describes a light, compact portable storage battery equipment for use where the current in the rail is small, intermittent or entirely absent and an external source of current is required. In connection with the Type HBT Bond Tester (described in Bulletin G-200) it forms an ideal equipment for testing all kinds of bonds under all kinds of conditions.

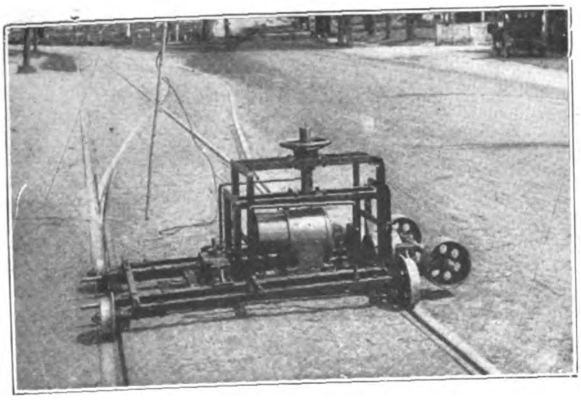
Send for Bulletins G-200 and G-201.

ROLLER-SMITH COMPANY
Electrical Instruments, Meters and Circuit Breakers

2128 Woolworth Bldg.
NEW YORK

WORKS:
Bethlehem, Penna.

Offices in Principal Cities in U. S. and Canada



"MIDGET"

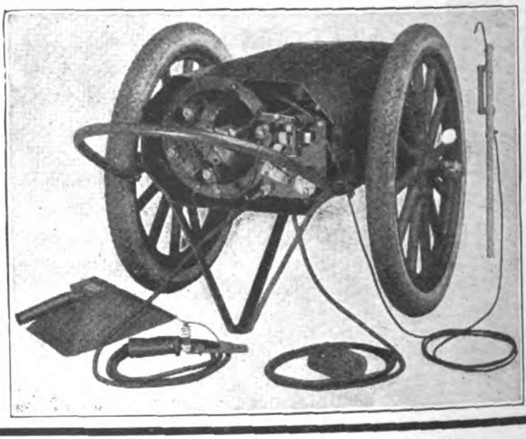
Inexpensive but complete!

In this machine, you get a rail grinder that will handle any kind of track grinding jobs and do it quickly and well. *Grinds surface, side or groove in rails, and smooths out corrugations.*

Can be used efficiently between cars on short headway because it's light and extremely easy to handle.

Our new illustrated circular tells the whole story. Send for it.

E. P. Seymour Rail Grinder Co.
Waltham, Mass.



Light—Handy—Reliable
Here's Why:—

1 The Liteweld Track Bonder and Welder takes less line current to operate than any other welder of equal welding power.

2 It does not disturb the line voltage when welding.

3 The operator cannot spoil the work by holding a long arc.

4 Arc is easy to maintain, even when welding in a corner or overhead.

5 The Liteweld gives a good even deposit of metal right from the start.

6 Small weight and size, because new design permits twice the output per lb. of active material in the machine.

LITEWELD CO.
2336 Woodland Ave. Cleveland, Ohio

Prove It—
on 30 Days' Free Trial

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE
CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

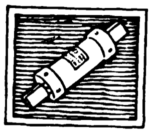
Lorain Special Trackwork
Girder Rails

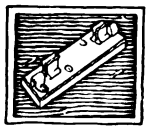
Electrically Welded Joints

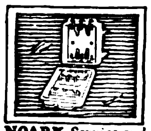
THE LORAIN STEEL COMPANY
Johnstown, Pa.

Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

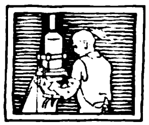
J-P Products of interest to Electric Railways

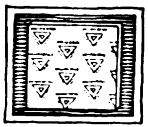

NOARK *Fuses*


NOARK *Fuse Clips*
CUTOUT BASES


NOARK *Service and Underground Boxes*

Railway and Mine hangers and insulators


J-P *Molding Service*
[Contract Basis]


VULCABESTON
Sheet and Rope Packing

JOHNS-PRATT CO. HARTFORD, CONN.

RAMAPO AJAX CORPORATION

Ramapo Automatic
Return Switch
Stands
for Passing
Sidings

RACOR
TRADE MARK

RACOR Tee Rail
Special Work.

Manganese
Construction

GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

FERALITE
ALUMINO-THERMIC WELDING MIXTURE
TRADE MARK

ALUMINO-THERMIC
JOINTS

New and independent process.
No inserts needed. Up-to-date and economical.

Alumino-Thermic Corp.,
Roselle Park, N. J.

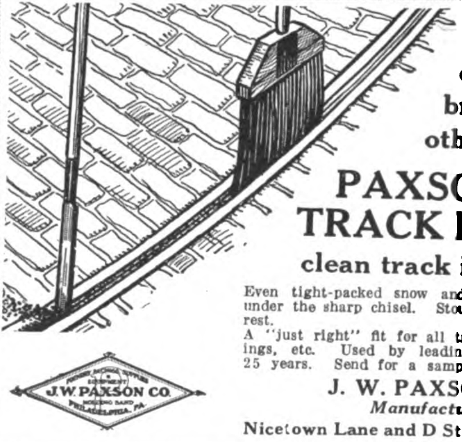
American
Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new
Rail Bond Book

American Steel & Wire
Company
CHICAGO
NEW YORK


J.W. PAXSON CO.

Steel chisel on one end—broom on the other.

PAXSON
TRACK BROOMS
clean track in a jiffy

Even tight-packed snow and ice soon breaks up under the sharp chisel. Stout steel bristles do the rest.
A "just right" fit for all trackwork, frogs, crossings, etc. Used by leading properties for over 25 years. Send for a sample—you'll be *pleased*.

J. W. PAXSON CO.
Manufacturers
Nicetown Lane and D St., Philadelphia, Pa.

METAL SAFETY CROSS TIES

Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.

REVOLUTIONIZES ROADBEDS

Write for descriptive folder and quotation.

METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

NEW and RELAYING RAILS
1 TON OR 1000

TRACK EQUIPMENT

L.B. FOSTER CO.
PITTSBURGH - PENNSYLVANIA

RAIL ACCESSORIES

NEW YORK - JERSEY CITY - PHILADELPHIA - HAMILTON, O.

E. MAIN
STATION
PLEASE
HAVE
CORRECT
FARE
READY
PLEASE
HAVE
CORRECT
FARE
READY

—SIGNS!

Make your own with
BODMER STENCIL SILK

—for—
Car Signs
Posters
Notices
Stencil Work

A silk bolting cloth, especially prepared for the silk screen process of stencilling as described in the ELECTRIC RAILWAY JOURNAL, issue of Dec. 15, 1923.

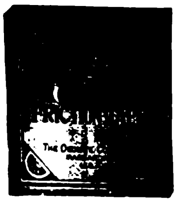
This process has proved to be faster, better and cheaper than open stencil work. Used by several of the largest electric railway companies.

If you want to make big savings on your sign, poster and general stencil work, ask us for further details on this process.

KRESS & CO.
370 Gold St., Brooklyn, N. Y.

DUNDEE "A" AND "B" FRICTION TAPES

Great Adhesive
Strength
High Quality
Long Life
Price Right



Write for Samples and Circulars

THE OKONITE CO., Passaic, N. J.
Incorporated 1884
Sales Offices: New York—Atlanta—Pittsburgh—San Francisco
Agents: Central Electric Co., Chicago, Ill. Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Eectric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.

OKONITE
TRADE MARK

THE WORLD'S STANDARD
"IRVINGTON"

Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper

Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of
Water Tube Boilers
of continuing reliability

BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

THE BABCOCK & WILCOX COMPANY
STEAM

WORKS
Bayonne, N. J.
Barberton, Ohio

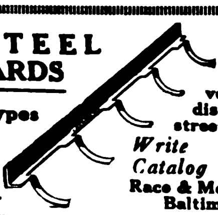
Makers of Steam Superheaters
since 1898 and of Chain Grate
Stokers since 1893

BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

GODWIN STEEL
PAVING GUARDS

Adapted to all types of rails and paving.

W. S. GODWIN CO., Inc.



Proven by service to economically prevent seepage and disintegration of street railway paving.

Write for Illustrated Catalog No. 20.

Race & McComas Sts.,
Baltimore, Md.

ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.

Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

A Single Segment or a Complete Commutator

is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.

Cameron Electrical Mfg. Co., Ansonia, Connecticut

OXYGEN
FOR CUTTING, WELDING, ETC.
INTERNATIONAL OXYGEN COMPANY
NEWARK NEW YORK PITTSBURGH TOLEDO

For Every Type of Car

ALPHADUCT

An Approved Non-Metallic Flexible Tubing-Conduit

Gives best mechanical protection to the insulation on electric wires due to its staunch construction.

ALPHADUCT COMPANY
136 Cator Ave., Jersey City, N. J.

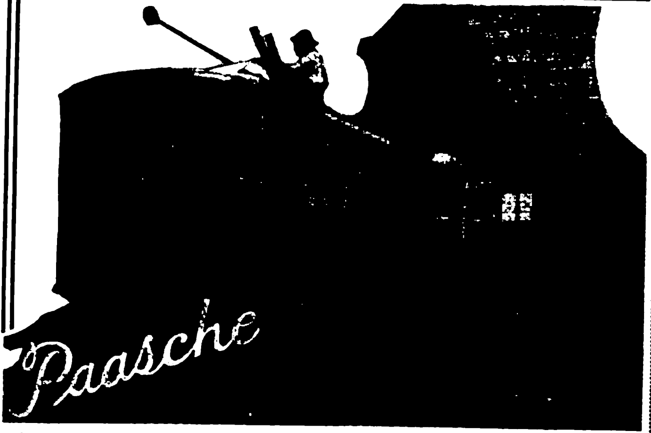
SAVING $12,000 YEARLY

One of the Hundreds of Large Users of Paasche Air Painting Equipment, says:

> **"As the varnish is drawn direct from the drums to the spray nozzles, it is not liable to air hardening or to picking up dirt, as is possible with the pails and hand brush work. To do all this work the hand brush method would require 6 additional painters and varnishers, and 4 more on the parts. Altogether, the Paasche equipment eliminates 10 men, saving approximately $12,000 to $15,000 yearly in labor."**

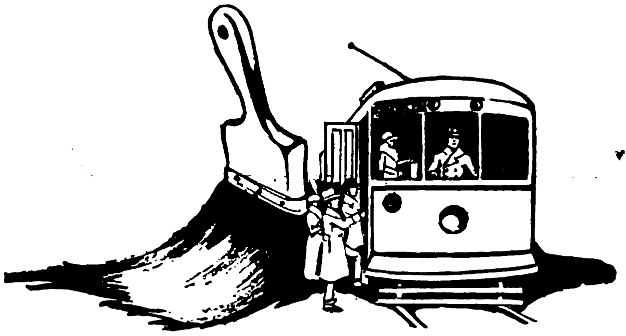
You, Too can probably make remarkable savings and improve your finishes to a great extent by the use of Paasche equipment. Write our Engineering Division regarding your requirements. Our twenty years' experience is at your disposal. No obligations.

PAASCHE AIR BRUSH CO.
1916 Diversey Parkway, CHICAGO, ILL.
***New York Office:* Dept. E, 54 Dey St.**



PORTABLE PAINTING EQUIPMENT

(Air Brushes, Painting Units, Compressors, Pneumatic Rubbing Machines, etc.)



Business may follow the paint brush *but*—

poor quality car finishes defeat their own ends through quick depreciation and increased maintenance.

Use paints and varnishes especially compounded to meet transportation service needs—durable, economical, super-quality.

Beckwith-Chandler CAR FINISHES

Used by many leading operators for exterior and interior work.

Brush or Spray Application
Flat Color or Varnish Systems
Enamel Systems
Color Varnish Systems

Full particulars on request.

Beckwith-Chandler Company
193-211 Emmett St., Newark, N. J.
320 Fifth Ave. New York

PERFECT MICANITE INSULATOR

Reg. U. S. Pat. Off.

ELECTRICAL INSULATION

Micanite armature and commutator insulation, commutator segments and rings, plate, tubes, etc., Empire oiled insulating materials; Linotape; Kablak; Mico; and other products—for the electrical insulating requirements of the railway.

Catalogs will gladly be furnished

MICA INSULATOR COMPANY
Sole Manufacturers of Micanite
***Established* 1893**

68 Church St., New York 542 So. Dearborn St., Chicago
Works: Schenectady, N. Y.

8-F

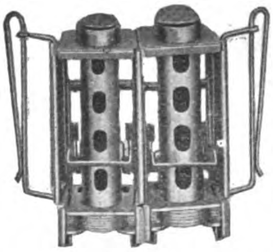
OHMER
FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

193
IN
10224

Type R-10

International Registers

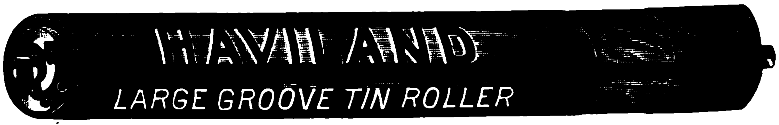
Made in various types and sizes to meet the requirements of service on street and city system. Complete line of registers, counters and car fittings.

Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

"Haviland" Self-Acting Shade Roller.

CAR ROLLERS

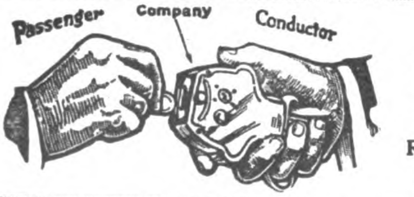


Car Rollers get hard work. Haviland Rollers are made to stand the hardest kind of work. That's why some of the greatest American Railway systems use Haviland Car Rollers.

Made with large groove, as illustrated, to permit easy and rapid mounting of shade cloth. Prompt deliveries on rollers constructed to live up faithfully to your specifications.

Some of the greatest railroad systems are large users of Haviland Rollers.

HAVILAND SHADE ROLLER CO., INC.
380 Lafayette Street New York City



Direct Automatic Registration By the Passengers
Rooke Automatic Register Co.
Providence, R. I.

75% of the electric railways use
B-V Punches
Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.

Cleveland Fare Boxes
Take your fares direct from car rider to counting room.
THE CLEVELAND FARE BOX CO.
Cleveland Ohio
CANADIAN CLEVELAND FARE BOX CO. LTD.,
PRESTON ONTARIO

HALE-KILBURN
CAR SEATS
For Every Class of Service
General Offices and Works: Philadelphia
Offices: New York, Chicago, St. Louis, Washington, San Francisco

Griffin Wheel Company

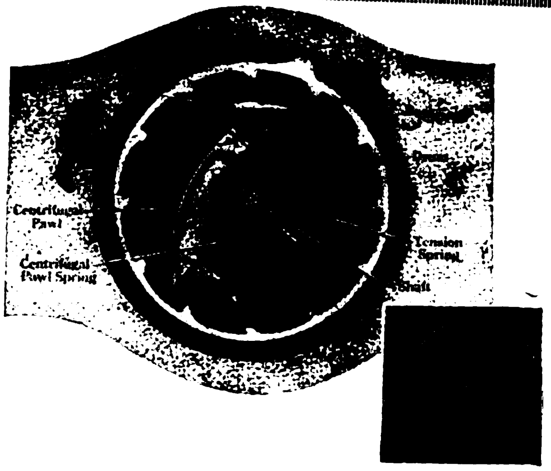
410 North Michigan Ave.
Chicago, Ill.

GRIFFIN
F. C. S.
WHEELS

For Street and Interurban Railways

FOUNDRIES:

Chicago	**Boston**	**St. Paul**
Detroit	**Kansas City**	**Los Angeles**
Denver	**Council Bluffs**	**Tacoma**



Ever stop your watch by winding it?

Overwinding will put the average retriever or catcher out of action. Added maintenance expense.

EARLL
Catchers and Retrievers

cannot be overwound. The one-piece tension spring maintains steady even tension throughout long years of service. It requires a minimum of winding effort, saving time, avoiding delays.

This and four other exclusive Earll Catcher and Retriever Features are vitally important. Get the whole story.

C. J. Earll. York, Pa.

You're having brush trouble

CORRECT IT

USE LE CARBONE CARBON BRUSHES

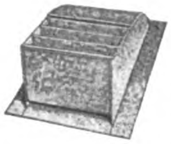
They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

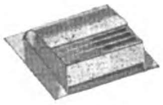
W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto

---

Fresh Air!



Type "A"



Type "C"

Cars now in service, poorly ventilated, can be provided with ventilating means at a cost negligible as compared with the results obtained.

Whether considering these cars, designing new cars, or rebuilding old ones, remember that efficient ventilation requires proper equipment.

N-L Ventilators are made to meet every demand.

Leading features of N-L Ventilators:
—*positive and adequate exhaust*
—*weatherproof and dustproof*
—*inconspicuous and positively noiseless*
—*unexcelled for ventilation and appearance.*

Write for "Superior Ventilation" and prices

N The Nichols-Lintern Co. **L**
7960 Lorain Ave.
Cleveland, Ohio

We Will Build This Attractive
PAGODA
FREE

for your Amusement Park

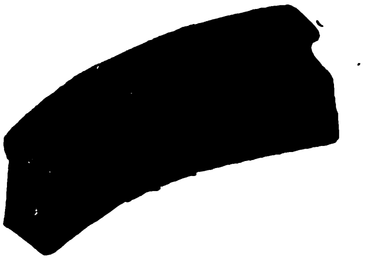
This handsome Pagoda root beer stand will be a big addition to your amusement park.

We will build this Pagoda in your amusement park, equip it fully with a Richardson Root Beer Barrel. It won't cost you anything—the concession privileges actually will pay you money.

Send for our proposition now. There's time to have the pagoda all ready for this season.

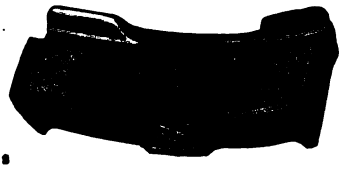
C. M. Walker Corporation
Rochester, N. Y.

Brake Shoes
A.E.R.A. Standards
Diamond "S" Steel Back is the Best Type



Standard
Patterns
for

SAFETY
CAR

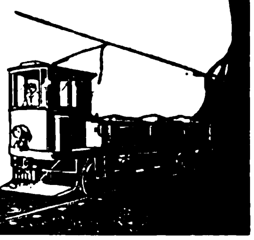


D-67 for Narrow Treads
D-87 for Wide Treads

American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

The Differential Car

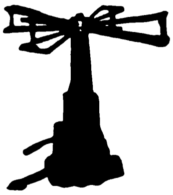
An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.



The Differential
Steel Car Co.
Findlay, Ohio

CARNEGIE
for
WHEELS
AXLES
RAILS
CROSS TIES

Carnegie Steel Company
PITTSBURGH, PENNA.



Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars
Perey Manufacturing Co., Inc.
30 Church Street, New York City

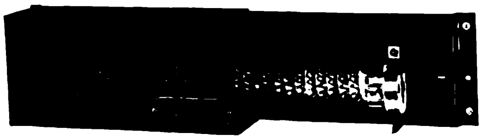
RAILWAY UTILITY COMPANY
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings:
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures

141-151 West 22d St.
Chicago, Ill.

Write for Catalogue

1828 Broadway
New York, N. Y.

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No.
478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

PS HEATERS

Car Heating and Ventilation

are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment. Now is the time to get your cars ready for next winter. Write for details.

The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

POSITIONS VACANT

A GENERAL track foreman wanted to have charge of four or five gangs on construction and general track maintenance work in Connecticut. State qualifications and give references. P-671, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

GENERAL shop foreman wanted for Middle West property, experienced in heavy traction equipment as well as city. In application, state qualifications, references and salary expected. P-678, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

WANTED—A-1 car wire and controller repairman, must understand the old type as well as the new. State wages expected in first letter. Apply Mr. H. T. Royal, Master Mechanic, Coast Cities Railway Co., Asbury Park, New Jersey.

POSITIONS WANTED

AS M. M. or with chance for advancement. Experienced low and high voltage D.C. equipment, passenger and freight, city and interurban. Expert on motor and controller repairs. PW-672, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

AUDITOR, with thorough experience large railway, electric and gas properties, seeks engagement. PW-677, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

GRADUATE engineer desires permanent position in larger field. Fifteen years' successful experience. Five in charge maintenance city and suburban system. Rehabilitation, design, special work, welding. PW-682, Electric Railway Journal, Real Estate Trust Bldg., Phila., Pa.

MASTER mechanic or engineer of equipment, technical education and five years' experience in manufacturing and maintenance of equipment. PW-681, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

SCHEDULES. Traffic manager and schedule maker, thoroughly experienced in city operation, wants whole or part time employment. PW-685, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

SUPERINTENDENT or assistant general manager on city or interurban road. Twelve years' successful experience with first-class record and references. Salary $3,000.00 to start. PW-687, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT or general superintendent. Twelve years connection with one of the largest and most successful steam railways in America. Five years operator, agent and yardmaster; four years general yardmaster large terminal; three years superintendent in charge all departments electrified subsidiary lines, operating high speed interurban trains and handling heavy carload freight traffic. Desire connection with large electrified property. Have record for establishing new low operating ratios and rendering more effective service. Can secure spontaneous co-operation from employees and meet the public. Reason for leaving present position, electric railway field limited. Prefer situation requiring initiative and executive abilty. Age 38. PW-686, Elec. Ry. Journal, Old Colony Bldg., Chcago, Ill.

FOR SALE

We offer for sale as a going concern the entire properties, franchises car barn equipment and right-of-ways of the Blue Ridge Traction Company, operating a 7½-mile electric railroad from Danielsville to Slatington, Pa., situated in the heart of the Lehigh Slate Regions.

This property is in first class operating condition. Terms will be made to suit the prospective purchaser. Apply to:

H. Sofranscy Co.
2 Allen Street, Allentown, Pa.

Rails!

When you need new or relaying rails, come to headquarters and get just what you want, in any quantity, and get them quick.

We always have a big stock of rails, from 12 lbs. to 100 lbs. per yard, for immediate delivery. Every rail inspected and guaranteed. Complete with the necessary angle bars.

When it comes to price we are also headquarters—we have complete stocks of new and relaying rails of all weights available for prompt shipment located in thirty convenient distributing points throughout the United States, Canada and Cuba—which in turn means we can make immediate shipments at unbeatable prices to our customers. "Tons of Rails Right at Your Door." Write, 'phone or wire us your requirements.

HYMAN-MICHAELS COMPANY
"The House of Dependable Service"
122 South Michigan Avenue, Chicago
Dealers in New and Relaying Rails, Locomotives and Railway Equipment

District Offices: New York, Woolworth Bldg.; St. Louis, Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.; Detroit, Book Bldg.; San Francisco, 234 Steuart St.

Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa., San Francisco. *Cable Address:* "Hymanmikel"

World's Largest Distributors of Rails

Relaying Rails
NEW RAILS – ACCESSORIES

Buy Guaranteed Relaying Rails and Save 30% to 50%

1 Ton or 1000

L B FOSTER CO
PITTSBURGH, PA. NEW YORK CITY
JERSEY CITY – PHILADELPHIA – HAMILTON, O.

FOR SALE

Electric Locomotive

Standard G. E. 50-ton Locomotive in first-class condition. Locomotive may be seen in daily operation.

ALBANY SOUTHERN R. R. CO.,
Rensselaer, N. Y.

CARS

3—Double end, closed cars, seating 32, Sheffield-Baldwin, with Allis-Chalmers, 301 motors, 32 ft. long, 4-ft., 8½-in. gauge, each....$1200
2—Open Trailers, 4-ft., 8½-in. gage; St. Louis Car Co., 21 ft., 6 in. long, each.......$350

ZELNICKER IN ST. LOUIS
Rail, Piling, Compressors, Generators, Etc.

TO HELP YOU
GET WHATEVER YOU NEED
"Searchlight" Advertising
G-4

FOR SALE

Deck Plate Girder Bridge

built for electric railway by American Bridge Co. 61 ft. long, 20 tons weight.

For particulars address
York Utilities Company
Kennebunk, Maine.

MOTORS For SALE

50 Westinghouse No. 101-B
40 Westinghouse No. 307
60 General Electric No. 80

Immediate Shipment Low Price

Electric Equipment Co.
Cars—Motors
601 Commonwealth Bldg., Phila., Pa.

FOR SALE

46 Syracuse Turnstiles For Cars
TRANSIT EQUIPMENT COMPANY
501 Fifth Avenue, New York

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.
Air Circuit Breakers
Roller-Smith Co.
Air Receivers & Aftercoolers
Ingersoll-Rand Co.
Ammeters
Roller-Smith Co.
Amusement Park Equipment
Walker Corp., C. M.
Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse E. & M. Co.
Armature Shop Tools
Elec. Service Supplies Co.
Automatic Return Switch Stands
Ramapo Ajax Corp
Automatic Safety Switch Stands
Ramapo Ajax Corp.
Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Johnson & Co., J. R.
St. Louis Car Co.
Axles (Front & Rear) Motor Truck and Passenger Car
Timken-Detroit Axle Co.
Axles, Steel
Carnegie Steel Co.
Axles, Trailer and Motor Bus
Timken-Detroit Axle Co.
Badges and Buttons
Elec. Service Supplies Co.
Int. Register Co., The
Barges, Steel
American Bridge Co.
Bearings and Bearing Metals
Bemis Car Truck Co.
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.
Bells and Gongs
Brill Co., The J. G.
Consolidated Car Heat'g Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Western Electric Co.
Boilers
Babcock & Wilcox Co.
Bond Testers
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Roller-Smith Co.
Bonding Apparatus
Amer. Steel & Wire Co.
Electric Railway Impt. Co.
Elec. Service Supplies Co.
Liteweld Company
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co.
Western Electric Co.
Bonds, Rail
Amer. Steel & Wire Co.
Electric Railway Impt. Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Page Steel & Wire Co.
Railway Track-work Co.
Rail Welding & Bonding Co.
Western Electric Co.
Westinghouse E. & M. Co.
Book Publishers
McGraw-Hill Book Co.
Boxes, Junction and Outlet
National Metal Molding Co.
Boxes, Switch
Johns-Pratt Co.
Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
American Bridge Co.
Bates Expanded Steel Truss Co.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
Western Electric Co.
Brake Adjusters
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.
Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co.
Johns-Manville, Inc.
National Brake Co.
St. Louis Car Co.
Safety Car Devies Co.
Bridges & Buildings
American Bridge Co.
Brooms, Track, Steel or Rattan
Paxson Co., J. W.
Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Westinghouse E. & M. Co.
Brushes, Wire, Pneumatic
Ingersoll-Rand Co.
Brush Holders
Anderson Mfg. Co., A. & J. M.
Buses, Motor
Brill Co., The J. G.
Brockway Corporation
Pierce-Arrow Motor Car Co.
St. Louis Car Co.
White Co.
Bus Seats
Hale-Kilburn Co.
Heywood-Wakefield Co.
Bushings
National Metal Molding Co.
Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Cables (See Wires and Cables)
Cambric Tapes, Yellow and Black Varnished
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Carbon Brushes (See Brushes, Carbon)
Car Panel Safety Switches
Consolidated Car Heat'g Co.
Westinghouse E. & M. Co.
Cars, Dump
Differential Steel Car Co.
St. Louis Car Co.
Car Lighting Fixtures
Elec. Service Supplies Co.
Car Panel Safety Switches
Consolidated Car Heat'g Co.
Westinghouse E. & M. Co.
Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.
Cars, Gas Rail
St. Louis Car Co.
Cars, Self-Propelled
General Electric Co.
Car Wheels, Rolled Steel
Bethlehem Steel Co.
Castings, Brass, Composition or Copper
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.
Castings, Gray Iron and Steel
Bemis Car Truck Co.
St. Louis Car Co.
Castings, Malleable and Brass
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
St. Louis Car Co.
Catchers and Retrievers, Trolley
Earll, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.
Catenary Construction
Archbold-Brady Co.
Western Electric Co.
Ceiling Car
Pantasote Co., Inc.
Cement Products
Portland Cement Co.
Change Carriers
Cleveland Fare Box Co.
Circuit-Breakers
General Electric Co.
Roller-Smith Co.
Westinghouse E. & M. Co.
Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
St. Louis Car Co.
Cloth and Stenill Silk Signs
Kress & Co.
Cleats
National Metal Molding Co.
Clusters and Sockets
General Electric Co.
Coal and Ash Handling (See Conveying and Hoisting Machinery)
Coil Banding and Winding Machines
Elec. Service Supplies Co.
Coils, Armature and Field
Economy Electric Devices Co.
General Electric Co.
Westinghouse E. & M. Co.
Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Coin Counting Machines
Cleveland Fare Box Co.
Intern'l Register Co.
Johnson Fare Box Co.
Coin Sorting Machines
Cleveland Fare Box Co.
Coin Wrappers
Cleveland Fare Box Co.
Commutator Slotters
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Commutator Truing Devices
General Electric Co.
Commutators or Parts
Cameron Elec'l Mfg. Co.
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co.
Compounds (Insulating & Splicing)
Compressors, Air
General Electric Co.
Ingersoll-Rand Co.
Western Electric Co.
Westinghouse Tr. Br. Co.
Compressors, Air Portable
Ingersoll-Rand Co.
Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.
Condenser Papers
Irvington Varnish & Ins. Co.
Conduits, Flexible
Alphaduct Co.
Conduits, Interior
National Metal Molding Co.
Connectors, Solderless
Westinghouse E. & M. Co.
Connectors, Trailer Car
Consolidated Car Heat'g Co
Elec. Service Supplies Co.
Ohio Brass Co.
Controllers or Parts
General Electric Co.
Westinghouse E. & M. Co.
Controller Regulators
Elec. Service Supplies Co.
Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.
Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.
Conveying and Hoisting Machinery
Columbia M. W. & M. I. Co
Copper Wire
Anaconda Copper Mining Co.
Page Steel & Wire Co.
Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., J. A.
St. Louis Car Co.
Samson Cordage Works
Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.
Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.
Cranes
Allis-Chalmers Mfg. Co.
Industrial Works
Universal Crane Co.
Cranes, Gas or Electric
Industrial Works
Universal Crane Co.
Cranes, Locomotive, Motor Truck & Portable
Industrial Works
Universal Crane Co.
Cross Arms (See Brackets)
Crossing Foundations
International Steel Tie Co.
Crossings
Ramapo Ajax Corp.
Crossing Signals (See Signals, Crossing)
Crossing, Frog & Switch
Ramapo Ajax Corp.
Crossing Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Crossings, Track (See Track, Special Work)
Crossings, Trolley
Anderson Mfg. Co., A.&J. M.
Ohio Brass Co.
Curtains and Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
Pantasote Co., Inc.
St. Louis Car Co.
Dealer's Machinery
Elec. Equipment Co.
Transit Equip. Co.
Derailing Devices (See also Track Work)
Wharton, Jr., & Co., Wm.
Derailing Switches, Tee Rail
Ramapo Ajax Corp.
Detective Service
Wish-Service, P. Edward
Doors & Door Fixtures
Hale-Kilburn Co.
St. Louis Car Co.
Door Operating Devices
Brill Co., The J. G.
Consolidated Car Heat'g Co.
General Electric Co.
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.
Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Drills, Rock
Ingersoll-Rand Co.
Drills, Track
Amer. Steel & Wire Co.
Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.
Dryers, Sand
Elec. Service Supplies Co.
Hetherington & Berner
Ears
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.
Ebony Asbestos Wood
Johns-Manville, Inc.
Electrical Wires and Cables
Amer. Electrical Works
Roebling's Sons & Co., J. A.
Western Electric Co.
Electric Furnaces
American Bridge Co.
Electric Grinders
Railway Track-work Co.
Rail Welding & Bonding Co.
Seymour Rail Grinder Co.
Electrodes, Carbon
Railway Track-work Co.
Electrodes, Steel
Railway Track-work Co.
Enamels
Beckwith-Chandler Co.
Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbins, J. Rowland
Buchanan & Laying Corp.
Byllesby & Co., H. M.
Day & Zimmermann, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Ong, Joe R.
Railway Audit & Inspection Co.
Richey, Albert S.
Robinson & Co., D. P.
Sanderson & Porter
Stevens & Wood, Inc.
Stone & Webster
White Eng. Corp., The J. G.
Wortham, Edwin
Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E & M. Co.
Fare Boxes
Cleveland Fare Box Co.
Economy Electric Devices Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.
Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.
Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.
Star Brass Works
Fibre and Fibre Tubing
Johns-Manville, Inc.
Westinghouse E. & M. Co.
Field Coils (See Coils)
Fire Extinguishers
Johns-Manville, Inc.
Flangeway Guards, Steel
Godwin Co., Inc., W. S.
Flaxlinum Insulation
Nat'l Ry. Appliance Co.
Floodlights
Elec. Service Supplies Co.
Flooring Composition
Johns-Manville, Inc.
Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.
Frogs, Track (See Track Work)
Frogs, Trolley
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.
Fuses, Cartridge, Non-Refillable and High Voltage
Johns-Pratt Co.
Fuses, Cartridge, Refillable
Johns-Pratt Co.
Fuses and Fuse Boxes
Consolidated Car Heat'g Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Fuses, Refillable
General Electric Co.
Gaskets
Johns-Manville, Inc.
Westinghouse Tr. Br. Co.
Gas-Electric Cars
General Electric Co.
Gasoline Torches
Economy Elec. Devices Co.
Gas Producers
Westinghouse E. & M. Co.
Gates, Car
Brill Co., The J. G.
St. Louis Car Co.
Gear Blanks
Bethlehem Steel Co.
Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.
Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.
Generating Sets, Gas-Electric
General Electric Co.
Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.
Gong (See Bells and Gongs)
Greases (See Lubricants)
Grinders and Grind. Supplies
Metal & Thermit Corp.
Railway Track-work Co.
Grinders, Portable
Buda Company
Railway Track-work Co.
Grinders, Portable Electric
Railway Track-work Co.
Seymour Rail Grinder Co.
Grinding Blocks and Wheels
Railway Track-work Co.
Ground Wires
Page Steel & Wire Co.
Guard Rail Clamps
Ramapo Ajax Corp.
Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.
Guards, Cattle
American Bridge Co.
Guards, Trolley
Elec. Service Sup. Co.
Ohio Brass Co.
Hammers, Pneumatic
Ingersoll-Rand Co.
Harps, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D. & Co.
Star Brass Works
Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Pneumatic Tie-Tampers
Paving Breakers
IR
18398

Ingersoll-Rand Pneumatic Paving Breakers and Tie Tampers in use on reconstruction of complicated crossing

Economical Reconstruction

Ingersoll-Rand pneumatic methods speed up track rehabilitation and cut the costs one-third to one-half.

Two men with I-R CC-25 "Paving Breakers" do more work than twelve to fifteen men with hand sledges and picks. Only a fraction of the labor is required with I-R Paving Breakers.

Pneumatic Tie Tampers are not only labor saving tools but tamp the track more uniformly, and are far more effective around frogs, switches and crossovers than hand methods.

Air power for these tools and methods is efficiently supplied from Ingersoll-Rand Portable Air Compressors, especial designed for railway work. Ask for complete information.

INGERSOLL-RAND COMPANY, 11 Broadway, New York

Offices in all principal domestic and foreign cities

For Canada, refer Canadian Ingersoll-Rand Company, Limited, 260 St. James St., Montreal.

206-TT

Ingersoll-Rand

Headlining
Pantasote Co., Inc.
Heaters, Car (Electric)
Consolidated Car Heat'g Co.
Economy Elec. Devices Co.
Gold Car Heat. & Light. Co.
Nat'l Ry. Appliance Co., P.
Smith Heater Co., Peter
Heaters, Car, Hot Air and Water
Elec. Service Sup. Co.
Smith Heater Co., Peter
Helmets—Welding
Railway Track-work Co.
Hoist and Lifts
Ford Chain Block Co.
Hoists, Portable
Ingersoll-Rand Co.
Hydraulic Machinery
Allis-Chalmers Mfg. Co.
Indicating Signals
Oskel Equipment Co.
Industrial Flooring
Johns-Manville, Inc.
Instruments, Measuring, Testing and Recording
Economy Elec. Devices Co.
Elec. Service Sup. Co.
General Electric Co.
Roller-Smith Co.
Western Electric Co.
Westinghouse E. & M. Co.
Insulating Cloth, Paper and Tape
General Electric Co.
Irvington Varnish & Ins. Co.
Johns-Manville, Inc.
Mica Insulator Co.
Okonite Co
Stand. Underground Cable Co.
Westinghouse E. & M. Co.
Insulating Silk
Irvington Varnish & Ins. Co.
Insulating Varnishes
Irvington Varnish & Ins. Co
Insulation (See also Paints)
Anderson, M. Co., A. & J. M.
Electric Ry. Equipment Co.
Electric Service Sup. Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Johns-Manville, Inc.
Mica Insulator Co.
Okonite Co.
Westinghouse E. & M. Co.
Insulation Slot
Irvington Varnish & Ins. Co.
Insulators (See also Line Material)
Anderson, M. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hemingray Glass Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co
Western Electric Co.
Westinghouse E & M. Co
Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.
Insulators, High Voltage
Lapp Insulator Co., Inc.
Jacks (See also Cranes, Hoists and Lifts)
Elec. Service Supplies Co.
Templeton-Kenly & Co.
Joints, Rail (See Rail Joints)
Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.
Symington Co., T. H.
Junction Boxes
Std. Underground Cable Co.
Lamps, Guards and Fixtures
Anderson M. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
Lamps, Arc & Incandescent (See also Headlights)
General Electric Co.
Westinghouse E. & M. Co.
Lamps, Signal and Marker
Nichols-Lintern Co.
Lanterns, Classification
Nichols-Lintern Co.
Lightning Protection
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.
Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson, M. Co., A. & J. M.
Archbold-Brady Co.
Columbia M. W. & M. I. Co.
Electric Ry Equipment Co.
Elec. Service Sup. Co.
Hubbard & Co.
Johns-Manville, Inc.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse E. & M. Co.
Locomotives, Electric
Baldwin Locomotive Wks.
General Electric Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Lubricating Engineers
Galena Signal Oil Co.
Standard Oil Co. of Indiana.
Texas Company
Universal Lubricating Co.
Lubricants, Oil and Grease
Galena-Signal Oil Co.
Standard Oil Co. of Indiana.
Texas Company
Universal Lubricating Co.
Machinery, Insulating
Amer. Insulating Mach. Co.
Manganese Steel Guard Rails
Ramapo Ajax Corp.
Manganese Steel Switches, Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.
Manganese Steel, Special Track Work
Bethlehem Steel Co.
Meters (See Instruments)
Mica
Mica Insulator Co.
Molding, Metal
Allis-Chalmers Mfg. Co.
National Metal Molding Co.
Motor Buses (See Buses, Motor)
Motors, Electric
Westinghouse E. & M. Co.
Motors and Generator Sets
General Electric Co.
Motormen's Seats
Allis-Chalmers Mfg. Co.
Brill Co., J. G.
Elec. Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.
Nuts and Bolts
Bethlehem Steel Co.
Bemis Car Truck Co.
Hubbard & Co.
Ohmmeters
Roller-Smith Co.
Oils (See Lubricants)
Omnibuses (See Buses, Motor)
Oxy-Acetylene (See Cutting Apparatus Oxy-Acetylene)
Oxygen
International Oxygen Co.
Packings
Johns-Manville, Inc.
Paint, Guns
DeVilbiss Mfg. Co.
Painting Equipment, Portable
Paasche Air Brush Co.
Paint, Spraying Devices
DeVilbiss Mfg. Co.
Paints and Varnishes (Insulating)
Mica Insulator Co
Paints & Varnishes (Preservatives)
Beckwith-Chandler Co
Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co.
Pavement Breakers
Ingersoll-Rand Co.
Paving Brick Vitrified
National Paving Brick M'fr's Assn.
Paving Guards, Steel
Godwin Co. Inc., W. S.
Paving Material
Amer. Br. Shoe & Fdy. Co.
Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.
Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.
Pinions (See Gears)
Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.
Pipe Fittings
Westinghouse Tr. Brake Co.
Planers (See Machine Tools)
Plates for Tee Rail Switches
Ramapo Ajax Corp.
Pliers, Rubber Insulated
Elec. Service Sup. Co.
Plugs
Natonal Metal Molding Co.
Pneumatic Tools
Ingersoll-Rand Co.
Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.
Poles, Metal Street
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Hubbard & Co.
Western Electric Co.
Pole Reinforcing
Hubbard & Co.
Poles & Ties Treated
Bell Lumber Co.
Poles, Ties, Posts, Piling & Lumber
Bell Lumber Co.
Poles, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
Nuttall Co., R. D.
Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

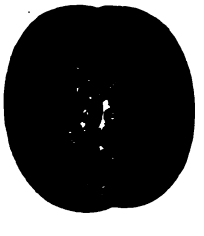
Porcelain, Special High Voltage
Lapp Insulator Co., Inc.
Potheads
Okonite Co.
Power Saving Devices
Economy Elec. Devices Co.
National Ry. Appliance Co.
Pressure Regulators
General Electric Co.
Westinghouse E. & M. Co.
Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Pumps, Vacuum
Ingersoll-Rand Co.
Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.
Rail Braces & Fastenings
Ramapo Ajax Corp.
Rail Grinders (See Grinders)
Rail Joints
Carnegie Steel Co.
Rail Joints—Welded
Lorain Steel Co.
Metal & Thermit Corp.
Rail Welding
Rail Welding & Bonding Co.
Rails, Relaying
Foster Co., L. B.
Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Foster Co., L. B.
Railway Paving Guards, Steel
Godwin Co., Inc., W. S.
Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.
Rail Welding
Metal & Thermit Corp.
Railway Track-work Co.
Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Gummings Mfg. Co
St. Louis Car Co.
Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Rooke Automatic Register Co.
St. Louis Car Co.
Reinforcement, Concrete
Amer. Steel & Wire Co.
Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.
Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.
Replacers, Car
Elec. Service Sup. Co.
Resistances
Consolidated Car Heat. Co.
Resistance, Wire and Tube
General Electric Co.
Westinghouse E. & M. Co.
Retrievers, Trolley (See Catchers and Retrievers, Trolley)
Rheostats
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co.
Rollers, Shade
Haviland Shade Roller Co., Inc.
Roofing Car
Pantasote Co., Inc.
Roofing, Asbestos
Johns-Manville, Inc.
Rosettes
National Metal Molding Co.
Sand Dryers
Hetherington & Berner, Inc.
Sand Houses
Hetherington & Berner, Inc.
Sand Storage
Hetherington & Berner, Inc.
Sanders, Track
Brill Co. The J. G.
Elec. Service Supplies Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.
Sash Fixtures, Car
Brill Co. The J. G.
St. Louis Car Co.
Sash, Metal, Car Window
Hale-Kilburn Co.
Scrapers, Track (See Cleaners and Scrapers, Track)
Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.
Seats, Bus
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Seats, Car (See also Rattan)
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
Pantasote Co., Inc.
St. Louis Car Co.
Second Hand Equipment
Electric Equipment Co.
Transit Equip. Co.

Shades, Vestibule
Brill Co., The J. G.
Shovels
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.
Side Bearings (See Bearings Center and Side)
Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.
Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.
Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc
U. S. Elec. Signal Co.
Wood Co., Chas. N.
Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
U. S. Elec. Signal Co.
Slack Adjusters (See Brake Adjusters)
Sleet Wheels and Cutters
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Smokestacks, Car
Nichols-Lintern Co.
Snow Sweepers, Rattan
Heywood-Wakefield Co.
Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Sockets and Receptacles
Johns-Manville, Inc.
National Metal Molding Co.
Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Special Adhesive Papers
Irvington Varnish & Ins. Co.
Special Trackwork
Bethlehem Steel Co.
Buda Company
Lorain Steel Co.
Spikes
Amer. Steel & Wire Co.
Splicing Compounds
Westinghouse E. & M. Co.
Splicing Sleeves (See Clamps and Connectors)
Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.
Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Steel and Steel Products
Morton Mfg. Co.
Steps, Car
Morton Mfg. Co.
Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.
Stop Signals
Oskel Equipment Co.
Storage Batteries (See Batteries, Storage)
Strain, Insulators
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.
Strand
Roebling's Sons Co., J. A.
Subway Boxes
Johns-Pratt Co.
Superheaters
Babcock & Wilcox Co.
Sweepers, Snow (See Snow Plows, Sweepers and Brooms)
Switchboxes
Johns-Manville, Inc.
Switch Stands & Fixtures
Ramapo Ajax Corp.
Switches, Safety
Johns-Pratt Co.
Switches, Selector
Nichols-Lintern Co.
Switches, Tee Rail
Ramapo Ajax Corp.
Switches, Track (See Track Special Work)
Switches and Switchboards
Allis-Chalmers Mfg Co.
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Synchroscopes
Roller-Smith Co.
Tampers, Tie
Ingersoll-Rand Co.
Railway Track-work Co.
Tapes and Cloths (See Insulating Cloth, Paper and Tape)
Tee Rail Special Track Work
Bethlehem Steel Co
Ramapo Ajax Corp.
Telephones and Parts
Elec. Service Supplies Co.
Western Electric Co.
Terminals, Cable
Std. Underground Cable Co.

Testing Devices, Meter
Johns-Pratt Co.
Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)
Thermostats
Consolidated Car Heat. Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter
Ticket Choppers & Destroyers
Elec. Service Supplies Co.
Ties, All Metal
Metal Safety R.R. Tie Co.
Ties and Tie Rods, Steel
Carnegie Steel Co
International Steel Tie Co.
Ties, Wood Cross (See Poles, Ties, Posts, etc.)
Tool Steel
Bethlehem Steel Co.
Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.
Torches, Acetylene (See Cutting Apparatus)
Tower Wagons and Auto Trucks
McCardell & Co., J. R.
Towers and Transmission Structures
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Westinghouse E. & M. Co.,
Track Grinders
Metal & Thermit Corp.
Railway Track-work Co.
Rail Welding & Bonding Co.
Seymour Rail Grinder Co.
Trackless Trolley Cars
Brockway Corporation
St. Louis Car Co.
Track, Special Work
Bethlehem Steel Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., W.
Transfer (See Tickets)
Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Transmission Towers and Structures
American Bridge Co.
Treads, Safety, Stair, Car Step
Morton Mfg. Co.
Trolley Bases
Anderson Mfg. Co., A. J. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.
Trolley Bases, Retrieving
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.
Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.
Trolley Material
Bates Expanded Steel Twiss
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Trolley Shoe
Miller Trolley Shoe Co.
Trolley Wheel Bushings
More-Jones Brass & Metal Co.
Trolley Wheels and Harps
More-Jones Brass & Metal Co.
Trolley Wheels (See Wheels, Trolley)
Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Page Steel & Wire Co.
Roebling's Sons Co., J. A.
Western Electric Co.
Trolleys and Trolley Systems
Ford Chain Block Co.
Trucks, Car
Baldwin Locomotive Works
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Tubing, Yellow & Black, Flexible Varnish
Irvington Varnish & Ins. Co.
Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.
Turnstiles
Damon-Chapman Co.
Elec. Service Supplies Co.
Percy Mfg. Co., Inc.
Turntables
American Bridge Co.

The Kalamazoo Trolley Wheels

have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

B. A. HEGEMAN, Jr., President C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas. F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.

Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

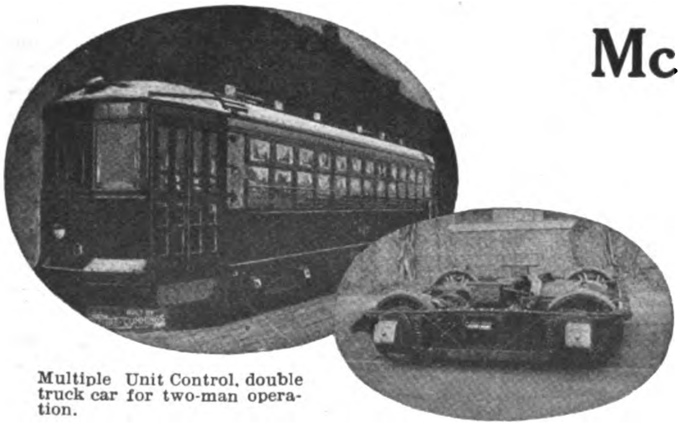
BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

HETHERINGTON & BERNER
INDIANAPOLIS, IND.

SAND DRYER HOUSE AND EQUIPMENT;
Dryers, Elevators, Etc.

This illustration above shows a completed 200-ton capacity sand dryer and storage house—"sand house"—for short. We furnished the dryer, feed elevator, hot sand elevator, rotary screen with hopper, distributing pipes from hopper, discharge gates and pipes and structural steel frame. The Street Railway Co. provided the foundations and lumber.



Multiple Unit Control, double truck car for two-man operation.

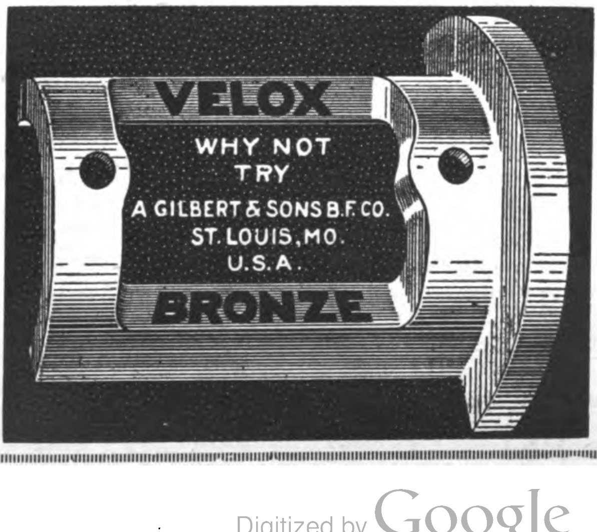
McGUIRE-CUMMINGS
Manufacturing Company

General Offices
111 W. Monroe St., Chicago, Ill.

Street Cars
Trucks

TULC
A LUBRICANT

We make a specialty of
ELECTRIC RAILWAY LUBRICATION
We solicit a test of TULC
on your equipment
The Universal Lubricating Co.
Cleveland, Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City


VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers
Irvington Varnish & Ins. Co.

Varnished Silks
Irvington Varnish & Ins. Co.

Varnishes
Beckwith-Chandler Co.

Ventilators, [illegible]
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Vitrified Paving Brick
National Paving Brick Mfrs. Assn.

Voltmeters
Roller-Smith Co.

Welded Rail Joints
Alumino-Thermic Corp.
Electric Railway Impt. Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co.

Welders, Portable Electric
Electric Railway Impt. Co.
Liteweld Co.
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co.

Welding and Cutting Tools
International Oxygen Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
General Electric Co.
Electric Railway Impt. Co.
International Oxygen Co.
Liteweld Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co.
Westinghouse E. & M. Co.

Welding Steel
Electric Railway Impt. Co.
Railway Track-work Co.

Welding Wire and Rods
Page Steel & Wire Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car Cast Iron
Griffin Wheel Co.

Wheels, Car Steel & Steel Tire
Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Gilbert & Sons, B. F. A.
More-Jones Brass & Metal Co.

Wheels, Trolley, Wrought Steel
Elec. Service Supplies Co.
General Electric Co.
Nuttall Co., R. D.

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Wire, Copper Covered Steel
Page Steel & Wire Co.

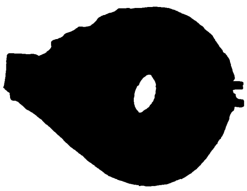
Wire Rope
Amer Steel & Wire Co
Roebling's Sons Co., J.A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co
General Electric Co
Okonite Co.
Page Steel & Wire Co.
Roebling's Sons Co., J. A.
Std. Underground Cable Co.
Western Electric Co.
Westinghouse E. & M. Co.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page
Allis-Chalmers Mfg. Co 54
Allison & Co., J. E 22
Alphaduct Co 55
Alumino-Thermic Corp. 53
Amer. Brake Shoe & Fdy. Co 58
American Bridge Co 23
American Car Co 65
American Electrical Works 51
American Insulating Mach. Co 51
American [illegible] & Wire Co 53
Anaconda Copper Mining Co., Front Cover
Anderson Mfg. Co., A. & J. M 44
Archbold-Brady Co 23
Arnold Co., The 22
Babcock & Wilcox Co 54
Baldwin Locomotive Works 49
Bates Expanded Steel Truss Co. 8
Beckwith-Chandler Co 55
Beeler, John A 22
Bell Lumber Co 64
Bemis Car Truck Co 42
Bethlehem Steel Co 28
Bibbins, J. Rowland 23
Bonney-Vehslage Tool Co 56
Brill Co., The J. G 65
Brockway Corporation 24
Buchanan & Layng Corporation. 23
Byllesby & Co., H. M 22
Cameron Electrical Mfg. Co 54
Carnegie Steel Co 58
Chillingworth Mfg. Co 64
Cleveland Fare Box Co 56
Collier, Inc., Barron G 32
Consolidated Car Fender Co 36
Consolidated Car Heating Co 34
Damon-Chapman Co 64
Day & Zimmermann, Inc 22
De Wilbiss Mfg. Co 45
Differential Steel Car Co., The 58
Drum & Co., A. L 23
Earll, C. I 57
Economy Electric Devices Co 15
Electric Equipment Co 59
Electric Railway Equipment Co. 10
Electric Railway Improvement Co. 16
Electric Service Supplies Co 9
Ford, Bacon & Davis 22
Ford Chain Block Co 46
Foster Co., L. B 53
"For Sale" Ads 59
Galena-Signal Oil Co 17
General Electric Co .. 18, Back Cover
Gilbert & Sons, A 63
Godwin Co., Inc., W. S 54
Gold Car Heating & Ltg. Co 58
Griffin Wheel Co 57
Hale-Kilburn Co 56
Haviland Shade Roller Co., Inc. 56
"Help Wanted" Ads 59
Hemingray Glass Co 51
Hemphill & Wells 22
Hetherington & Berner, Inc 63
Heywood-Wakefield Co 46
Holst, Englehardt W 22
Hubbard & Co 51
Industrial Works 45
Ingersoll-Rand Co 61
International Oxygen Co 54
International Register Co., The .. 56
International Steel Tie Co 7
Irvington Varnish & Insulator Co. 54
Jackson, Walter 22
Jeandron, W. J 57
Johns-Manville, Inc 44
Johns-Pratt Co 53
Johnson & Co., J. R 64
Johnson Fare Box Co 56
Kress & Co. 54
Kuhlman Car Co 65
Lapp Insulator Co., Inc 51
Le Carbone Co 57
Liteweld Co 52
Lorain Steel Co 53
McCardell Co., J. R 52
McGraw-Hill Book Co 48
McGuire-Cummings Mfg. Co 63
Metal & Thermit Corp 47
Metal Safety Railway Tie Co 53
Mica Insulator Co 55
Miller Trolley Shoe Co 38
More-Jones Brass & Metal Co .. 43
Morton Mfg. Co 64
Nachod Signal Co., Inc 51
National Brake Co 21
National Paving Brick Mfrs. Assn. 31
National Metal Molding Co 39
National Pneumatic Co., Inc 11
National Railway Appliance Co. 63
N. Y. Switch & Crossing Co 53
Nichols-Lintern Co. 57
Nuttall Co., R. D 50
Ohio Brass Co 5
Ohmer Fare Register Co 56
Okonite Co., The 54
Ong, Joe R 23
Oskel Equipment Co 64
Paasche Air Brush Co 55
Pantasote Co., Inc 40
Page Steel & Wire Co 47
Parsons, Klapp, Brinckerhoff & Douglas 22
Paxson Co., J. W 53
Perey Mfg. Co., Inc 58
Pierce-Arrow Motor Car Co 27
Portland Cement Ass'n 35
Positions Wanted & Vacant 59
Railway Audit & Inspection Co. 22
Rail Welding & Bonding Co 14
Railway Track-work Co 6
Railway Utility Co 58
Ramapo Ajax Co 53
Richey Albert S 22
Robinson Co., Dwight P 23
Roebling's Sons Co., John A 51
Roller-Smith Co 52
Rooke Automatic Register Co .. 56
St. Louis Car Co 50
Safety Car Devices Co 12
Samson Cordage Works 64
Sanderson & Porter 22
Searchlight Section 59
Seymour Rail Grinder Co 52
Shaw, Henry M 51
Smith Heater Co., Peter 58
Standard Oil Co 37
Standard Underground Cable Co. 51
Star Brass Works 63
Stevens & Wood, Inc 22
Stone & Webster 22
Stucki Co., A 64
Symington Co., T. H 41
Templeton, Kenly & Co 30
Texas Co 33
Timken-Detroit Axle Co 29
Tool Steel Gear & Pinion Co., The 27
Transit Equip. Co 59
U. S. Electric Signal Co 51
Universal Crane Co 48
Universal Lubricating Co 63
Walker, C. M., Corp 58
"Want" Ads 59
Wason Mfg. Co 65
Western Electric Co 26
Westinghouse Electric & Mfg. Co. 2, 4
Westinghouse Traction Brake Co. 13
White Co. 25
White Engineering Corp., J. G .. 22
Wish Service, The P. Edw 23
Wood Co., Chas. N 51
Wortham, Edwin 23

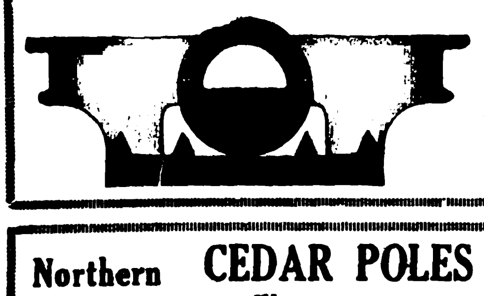
100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago


CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. *Write Us.*
Chillingworth Mfg. Co.
Jersey City, N. J.

SAMSON SPOT WATERPROOFED TROLLEY CORD

Trade Mark Reg. U. S. Pat. Off.
Made of extra quality stock firmly braided and smoothly finished.
Carefully inspected and guaranteed free from flaws.
Samples and information gladly sent.
SAMSON CORDAGE WORKS, BOSTON, MASS.

FOUR AND FIVE ARM
TURNSTILES
TICKET BOXES AND CHOPPERS
DAMON-CHAPMAN CO.
234 Mill Street : : : Rochester, N. Y.

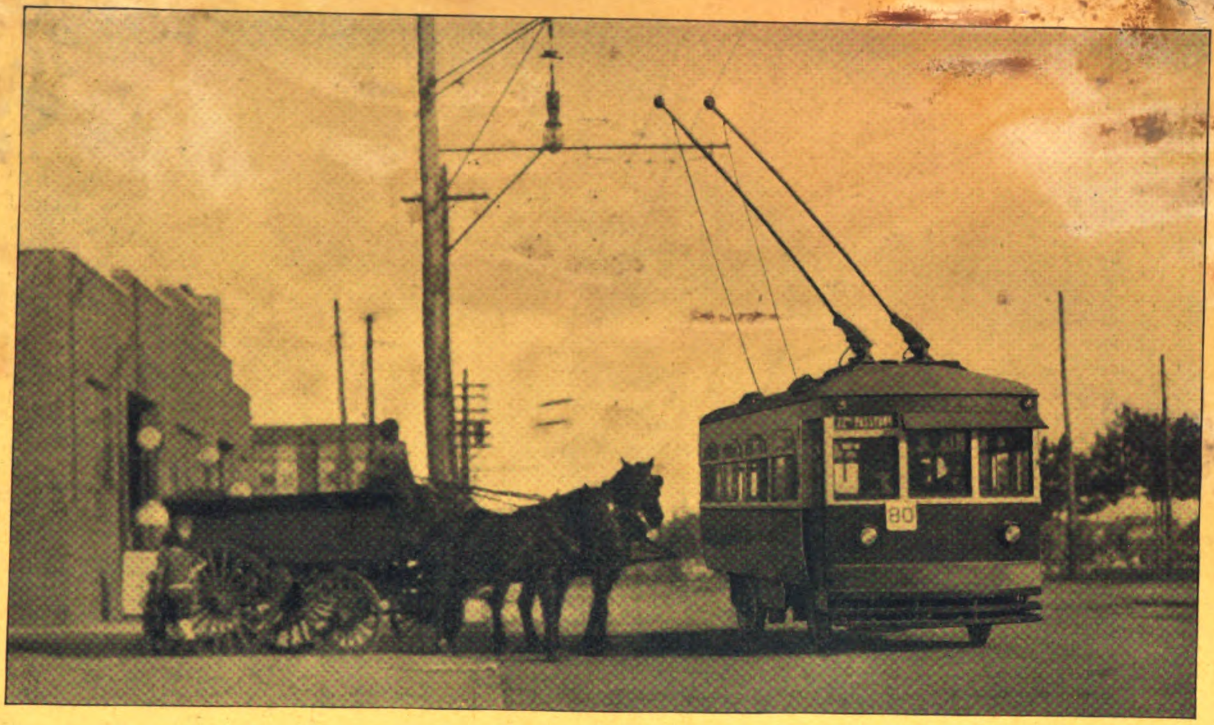

STUCKI
SIDE
BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

"OSKELITE"
The Stop Light for street cars. Operates from brake system. Details on request.
The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.

Brill Rail-less Cars
Serve Philadelphia



Oregon Avenue Installation acting as feeder line to electric railway cars

To Philadelphia goes the honor of having in operation the largest installation of Rail-less Cars in the United States. All cars operated are of the Brill Rail-less street car type, mounted on Brill Rail-less car chasses, equipped with two 25 Hp. motors. They are furnishing transportation over a route which previously was without public conveyance, and act as feeders to electric lines intersecting with Oregon Avenue.

Brill Rail-less Cars offer electric railways a type of equipment capable of meeting the transportation requirements of new territories adjacent to their lines at comparatively low initial and operating costs.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO. — G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO. — WASON MANF'G CO. SPRINGFIELD, MASS.

Performance Wins Again

The successful operation of 5 trolley buses in Rochester, N. Y., was sufficient recommendation for adding 4 more buses—G-E Motors and Control again specified.

G-E
5-256

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

GENERAL ELECTRIC

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

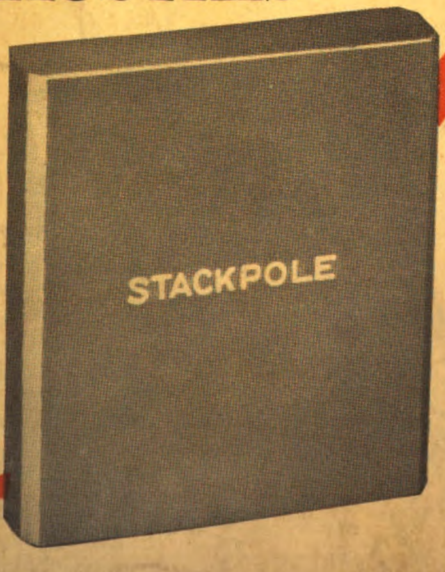
McGraw-Hill Company, Inc. April 26, 1924 Twenty Cents per Copy

ELECTRIC RAILWAY JOURNAL

TF
701
.T7

PROPERTY OF
TECHNICAL PUBLICATIONS LIBRARY
U. OF VA. SCHOOL OF ENGINEERING

STACKPOLE CARBON BRUSHES



The real reason—

Even motormen notice the improvement in operation, the decrease in commutator troubles and the greater freedom from pull-ins.

What causes it, they ask? The answer is—Stackpole Carbon Brushes.

Grade L-30 is an exceptionally efficient brush, of the utmost uniformity in quality, peculiarly suited to the overloads and heavy duty of traction motors. It is self lubricating, minimizes sparking and affords smooth noiseless commutation.

Prolongs the life of commutators.

STACKPOLE CARBON COMPANY
ST. MARY'S, PENNA.

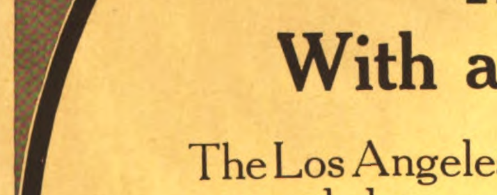
49
ROLLER SK
AT LINCOLN

Keeping Pace With a Growing Demand

The Los Angeles Railways, faced with materially increased demands for mass transportation, recently purchased 120 additional low-floor cars, which are to be equipped with four Westinghouse Type 514-L, 40-hp. Motors and HL Control, arranged for train operation.

Upon delivery of this equipment there will be 1200 Type 514 motors and more than 300 low-floor HL-controlled cars, arranged for train operation on this property.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries


HL Switch Group for Low-Floor Cars

W
WESTINGHOUSE ELECTRIC

Westinghouse

Vol. 63, *No.* 17

New York, April 26, 1924

Pages 643-680

ELECTRIC RAILWAY JOURNAL

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

MORRIS BUCK
Associate Editor

C. W. SQUIER
Associate Editor

JOHN A. MILLER, JR.
Assistant Editor

G. J. MACMURRAY
News Editor

CHARLES GORDON
Western Editor
Old Colony Bldg., Chicago

MERRILL B. KNOX
Editorial Assistant
Old Colony Bldg., Chicago

CARL W. STOCKS
Associate Editor

CONTENTS

Editorials 643

Progress in Noiseless Substation Design 645
BY L. J. TURLEY.
The Los Angeles Railway has developed substation buildings to harmonize with surroundings in residential districts. Use of automatics has produced satisfactory operating results and substantial economies, which are itemized.

Looping Back Reduces Delays by 28 per Cent 651
The downtown rerouting recently inaugurated by the United Electric Railways of Providence, R. I., has speeded up the car service and reduced congestion. At the same time a change was made in the method of fare collection.

Tractor-Drawn Plow Cuts High Ice 653

Signs Tell Strangers How to Reach Their Destinations by Railways 653
BY W. H. BOYCE.

New Seating Arrangement to Increase Capacity 654
Seats for three on one side and two on the other side increase capacity of multiple-unit coaches of the New Haven Railroad 38 per cent.

St. Louis Valuation 655

The Readers' Forum 656

Association News and Discussion 658

Badgers View Utility Business Broadly 658
Responsibilities of utility management, speakers' bureau activity and training of women employees for publicity work are considered. Railway section holds lively discussions.

The Commission's View of Platform Men 660
BY ANDREW L. MCDONALD.

Accounting Practice on the North Shore Line 661
BY C. R. MAHAN.

Effect of the Automobile on Passenger Traffic 662
BY DUDLEY MONTGOMERY.

The Electric Railway Situation Today 663
BY W. H. SAWYER.

I. C. C. Considers Mail Rates 664
Maintenance of Equipment 666
News of the Industry 669
Financial and Corporate 675
Personal Notes 678
Manufactures and the Markets 679

McGraw-Hill Company, Inc., Tenth Ave. at 36th St., New York

JAMES H. MCGRAW, President
ARTHUR J. BALDWIN, Vice-President
MALCOLM MUIR, Vice-President
E. J. MEHREN, Vice-President
MASON BRITTON, Vice-President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
C. H. THOMPSON, Secretary

WASHINGTON:
Colorado Building
CHICAGO:
Old Colony Building
PHILADELPHIA:
Real Estate Trust Building
CLEVELAND:
Leader-News Building
ST. LOUIS:
Star Building
SAN FRANCISCO:
883 Mission Street
LONDON:
6 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal-Press
Ingeniería Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Journal of Electricity
(Published in San Francisco)
Industrial Engineer
(Published in Chicago)
Electrical Retailing
(Published in Chicago)
American Machinist—European Edition
(Published in London)

The annual subscription rate is $1 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.
Copyright, 1924, by McGraw-Hill Company, Inc.
Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, at New York, under the Act of March 3, 1879. Printed in U.S.A.

It's All in the Family

DURING a visit to a Southern city one of the editors of this paper, in conversation with the president of the local electric railway, expressed a desire to see the company's repair shops. Because the shops were a considerable distance away from the office and the president had another appointment later in the day, he was unable to go out there himself. So he sent for one of the engineers of the railway and instructed that the editor be conducted to the shops.

"Show him all there is out there. Tell him whatever he wants to know. It's all in the family, anyhow."

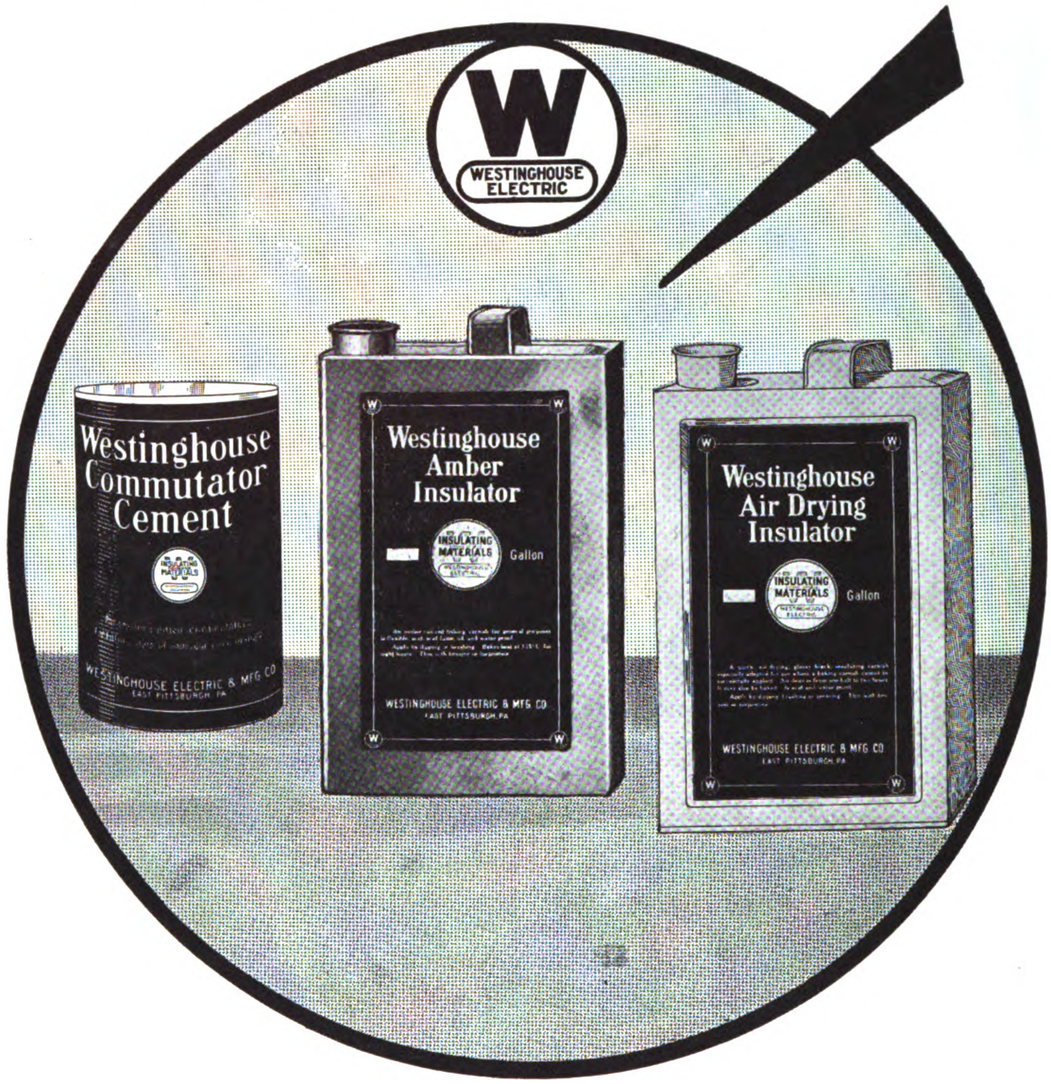
Of course, we are always pleased to have the doors thrown open, and full information concerning methods of operation and maintenance put at our disposal. But to have it done because the editors of ELECTRIC RAILWAY JOURNAL are considered to be members of the family, is particularly gratifying. It shows appreciation of the fact that the interests of the industry and the interests of the JOURNAL are the same.

Information furnished us by an electric railway is never printed contrary to the wishes of that company. If the time is felt to be inopportune for publication of some particular matter, we are always willing to wait until the company feels that the proper time has come. But the more closely we are in touch with actual conditions—the more the JOURNAL is treated as a member of the family—the better the paper can serve the interests of the industry.

Number of Copies Printed, 6,075

Advertising Index—Alphabetical, 40; Classified, 36, 38; Searchlight Section, 35

Varnish Plus


WESTINGHOUSE ELECTRIC
Westinghouse Commutator Cement
Insulating Materials
Westinghouse Electric & Mfg Co East Pittsburgh, PA
Westinghouse Amber Insulator
Insulating Materials
Gallon
Westinghouse Electric & Mfg Co East Pittsburgh, PA
Westinghouse Air Drying Insulator
Insulating Materials
Gallon
Westinghouse Electric & Mfg Co East Pittsburgh, PA

When you buy Westinghouse Insulating Varnishes and Compounds, you get in addition to better materials, the benefit of the great amount of research work done in the Westinghouse laboratories.

You get the same varnishes and compounds used in the manufacture of Westinghouse electrical apparatus.

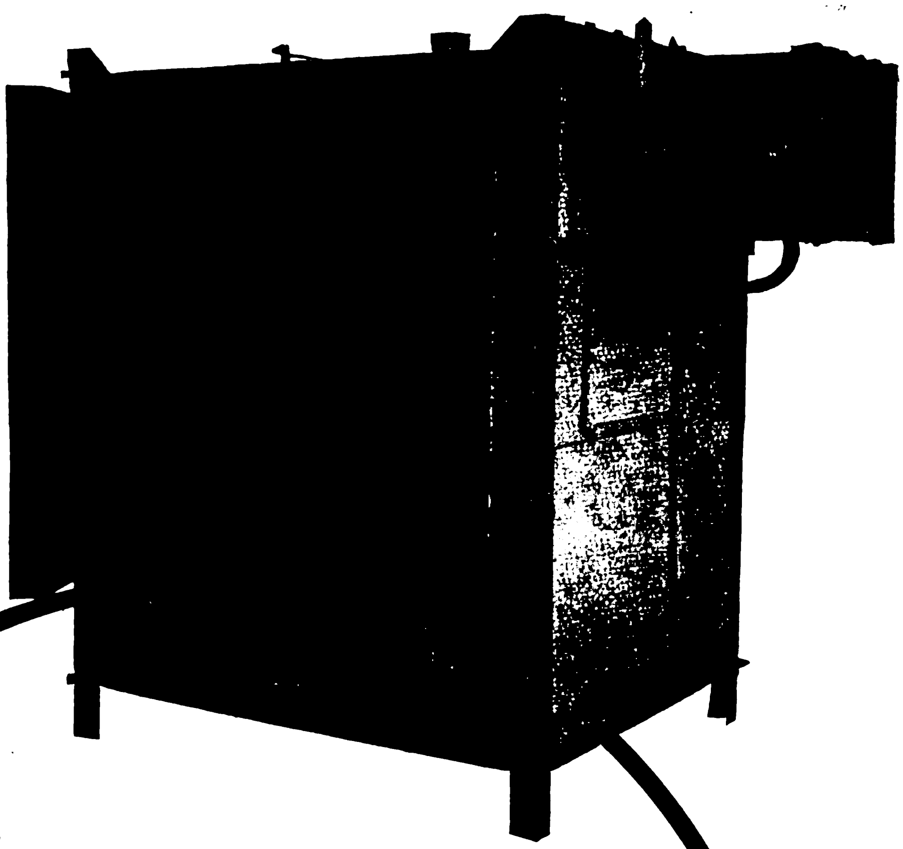
You get the benefit of the experience of Westinghouse engineers in the use of these materials and, also, their services, if you so desire, to help you conduct tests or solve problems of insulation application.

Our free booklet discussing the proper application of insulating varnishes and compounds will be sent to you on request.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the
United States and Foreign Countries

Member American Electric Railway Association AERA

Westinghouse



Heat

When you want it —

Just put in the load, set the thermostat at the temperature you wish to maintain and turn on the power. When the time of baking is up, if you wish to use the oven again right away—well and good. But, if you don't want to use it again for a day, or a week, or even for a month, when the time comes, you will find the Westinghouse Type K electric oven still ready. No time is lost lighting burners, adjusting valves, or waiting for steam. The electric oven is always ready when you want it.

Westinghouse Type K industrial ovens are shipped completely assembled, ready to install. They are made in many sizes, suitable for operating at temperatures up to 700° Fahrenheit.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the
United States and Foreign Countries

W
WESTINGHOUSE ELECTRIC

MEMBER AERA

Write for Leaflet
1815
describing
these ovens.

Westinghouse

Heed the silent rubber tread

"Ride on rubber" say bus and private motor car—and the public does. Why? Speed, comfort, noiselessness. These same qualities help sell rail transportation too — and nothing helps more than well maintained track. Only on good track can electric railway cars combine speed with safety, comfort and relative noiselessness. Only by consistent grinding at cupped joints, battered special work or corrugated rail can you economically maintain speedy, safe and silent track.

See the silencers pictured at your right—approved rail grinders and welders that are helping maintenance-of-way men on large and small roads everywhere. All the facts in print are yours for a word.

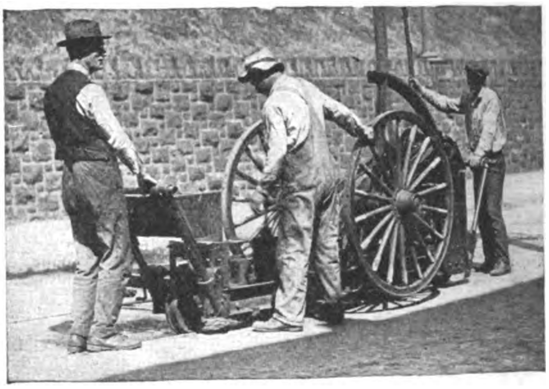
Railway Trackwork Co.

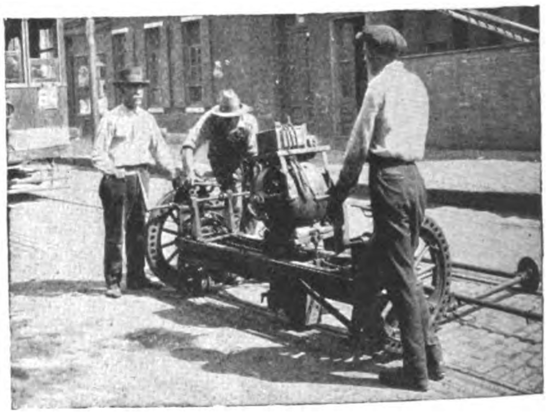
3132-48 East Thompson Street, Philadelphia

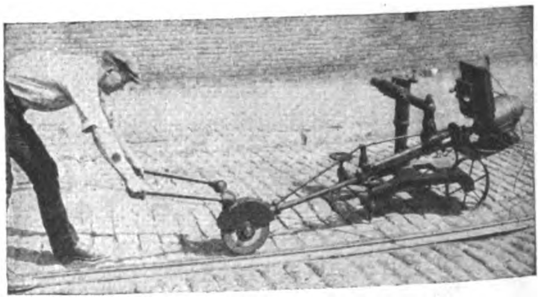
AGENTS:

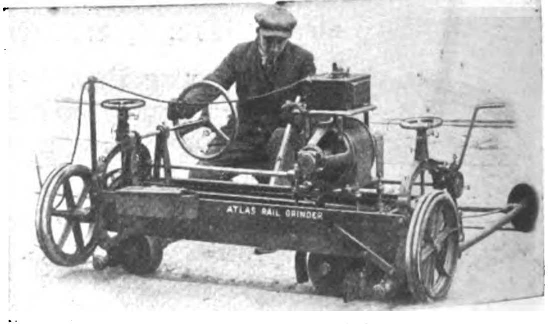
Chester F. Gailor, 30 Church St., New York.
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
Atlas Railway Supply Co., Chicago
J. H. Doerr, Los Angeles
Equipment & Engineering Co., London

(169)

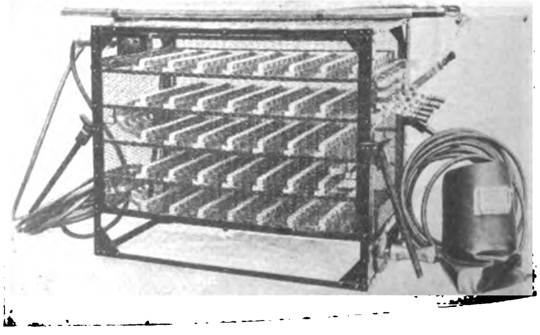

"Reciprocating" Track Grinder


"Universal" Rotary Track Grinder

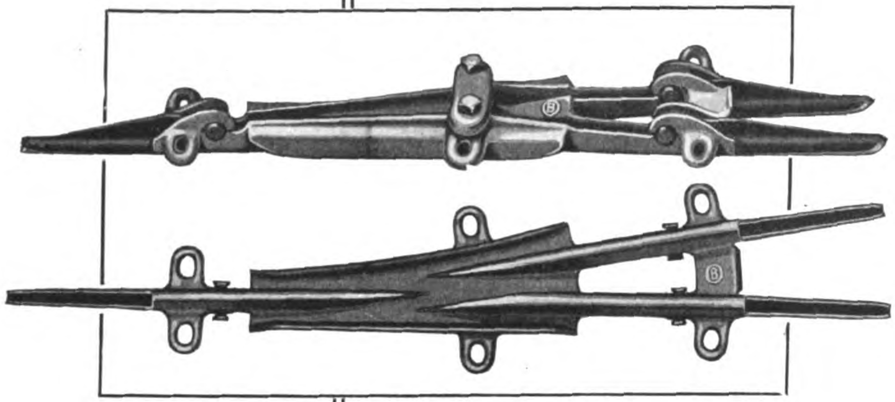

"Hercules" Swing Frame Rail Grinder



"Atlas" Rail Grinder

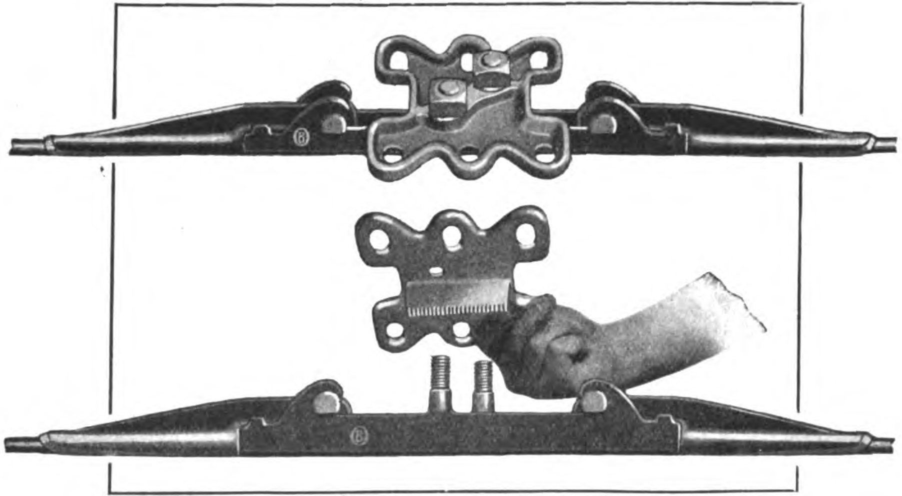

"Ajax" Electric Arc Welder

Operating Economies in these O-Bs



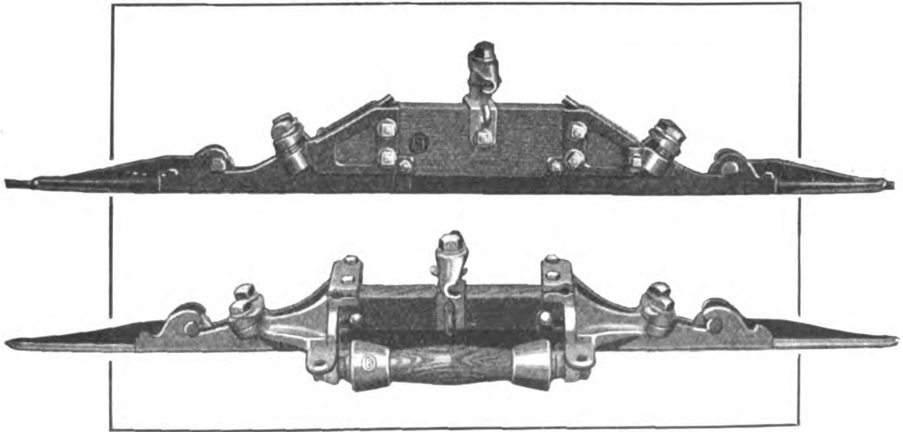
"B C" Frog

The runners are formed up to the center of the pan casting. The trolley wheel thus travels from end to end of the BC on the groove instead of on the flanges. The BC Frog can be placed farther back towards the switch point, thus reducing the drag, or distance the wheel rides at an angle on the main line wire. The trolley wire, the trolley wheel and the frog all last longer.



"C" Strain Plate

A separable strain plate that firmly grips the wire by a serrated clamp casting held in placed by two $\frac{5}{8}$-inch studs. There is good clearance and a smooth underrun for either trolley wheel or pantograph. Like the other O-B devices shown here the C Strain Plate is provided with renewable bronze cam tips. The runner casting is bronze and the clamp malleable iron.



"C" Section Insulator

The insulating beam is carefully selected and seasoned second-growth hickory impregnated and varnished. Rocker clamps for trolley ends work on cam principle so that the holding power increases as the tension increases.

"A-4" Section Insulator

Entire trolley tension is sustained by two O-B wood strain insulators. Runner piece is renewable fibre. Trolley wire is held by rocker clamps like on the Type C.

Renewable Bronze Cam Tips on All These O-B Fittings

The Ohio Brass Co.

Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL — ELECTRIC RAILWAY CAR EQUIPMENT — RAIL BONDS — HIGH TENSION PORCELAIN INSULATORS — THIRD RAIL INSULATORS

NEW YORK — PHILADELPHIA — PITTSBURGH
CHICAGO — CHARLESTON, W. VA.
LOS ANGELES — SAN FRANCISCO — PARIS, FRANCE

Western Red Cedar

Light, Durable and Strong
Plain or Treated Poles

Northern White Cedar

On the banks of Puget Sound

From this yard, at Everett, Washington, thousands of Western Red Cedar poles, cut in Washington and British Columbia, are handled, sorted, seasoned and prepared for shipment. It is one of the largest and most efficient pole handling yards in the world. The photograph shows only a section of the yard.

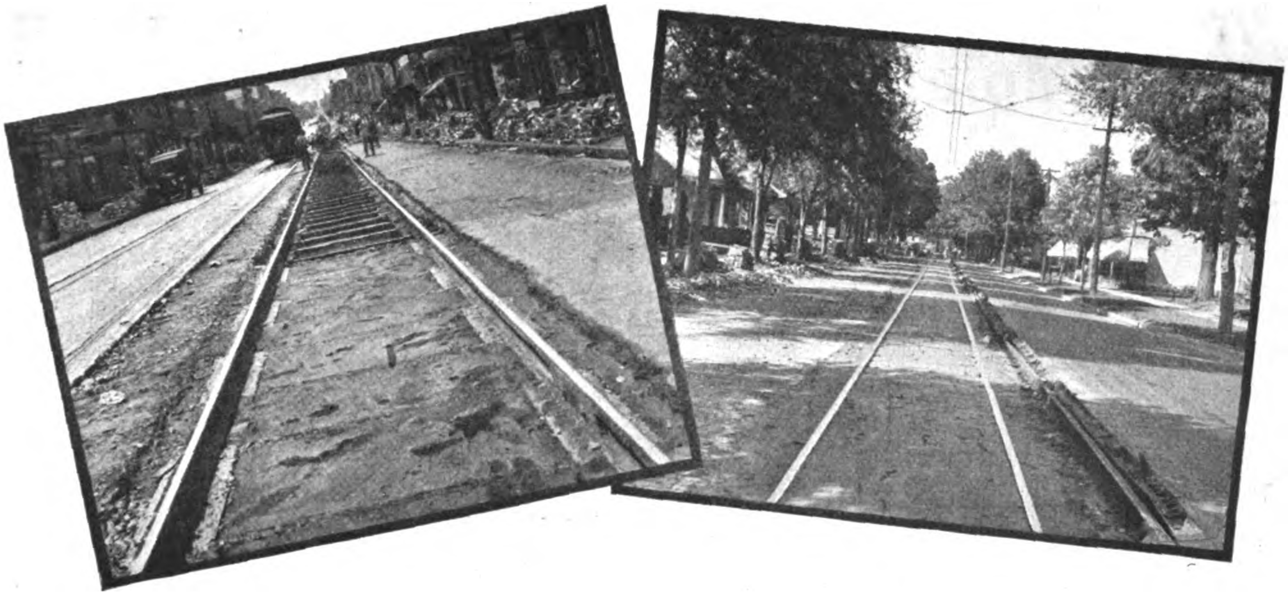
National Pole facilities make possible a pole delivery service that is unapproachable in the entire cedar pole industry.

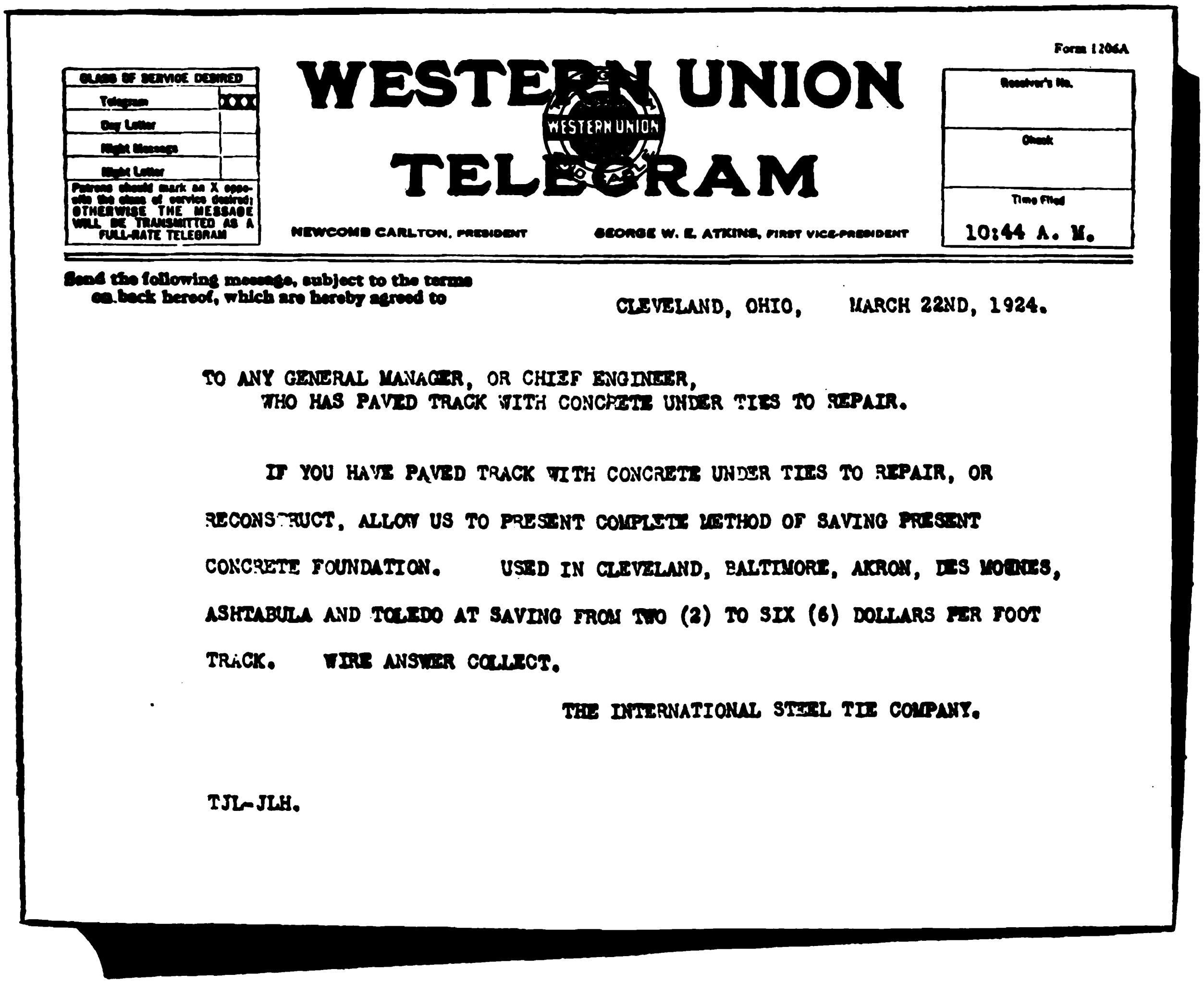
NATIONAL POLE COMPANY NPCo

Escanaba, Michigan

Western Electric Company Distributors

Sales Offices in 47 Principal cities





Form 1206A

CLASS OF SERVICE DESIRED	
Telegram	XXX
Day Letter	
Night Message	
Night Letter	

Patrons should mark an X opposite the class of service desired; OTHERWISE THE MESSAGE WILL BE TRANSMITTED AS A FULL-RATE TELEGRAM

WESTERN UNION TELEGRAM

NEWCOMB CARLTON, PRESIDENT GEORGE W. E. ATKINS, FIRST VICE-PRESIDENT

Receiver's No.
Check
Time Filed 10:44 A. M.

Send the following message, subject to the terms on back hereof, which are hereby agreed to

CLEVELAND, OHIO, MARCH 22ND, 1924.

TO ANY GENERAL MANAGER, OR CHIEF ENGINEER,
WHO HAS PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR.

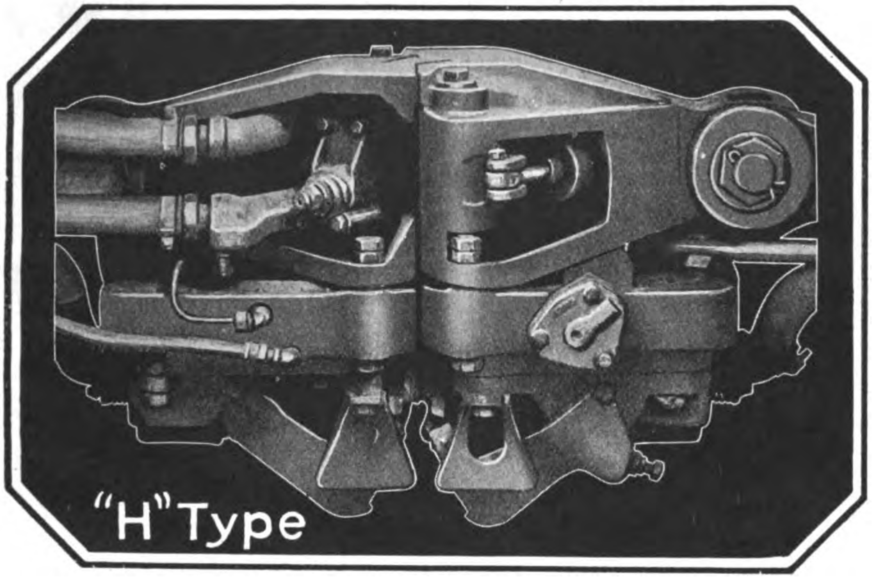
IF YOU HAVE PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR, OR RECONSTRUCT, ALLOW US TO PRESENT COMPLETE METHOD OF SAVING PRESENT CONCRETE FOUNDATION. USED IN CLEVELAND, BALTIMORE, AKRON, DES MOINES, ASHTABULA AND TOLEDO AT SAVING FROM TWO (2) TO SIX (6) DOLLARS PER FOOT TRACK. WIRE ANSWER COLLECT.

THE INTERNATIONAL STEEL TIE COMPANY.

TJL-JLH.

Steel Twin Tie Track

"Couple your cars automatically"



The Automatic Coupler For Heavy Service

The "H" type automatic car, air and electric coupler, one of the Westinghouse "Tight-Lock" models, is built especially for heavy service requirements—for subway, elevated and high-speed interurban trains.

This coupler embodies all the features which years of experience in automatic coupler design and manufacture have shown to be desirable for dependable, high-class service.

Connections made with all Westinghouse couplers are absolutely rigid — the greater the stress, the tighter they lock.

3 Sizes

Westinghouse Automatic Couplers are furnished in three separate sizes to meet the requirements of all classes of service—the "H" type for heavy, high-speed cars, the "K-1-A" for light and medium-weight cars and the "C-3-A" for light cars in cases where the electric feature is not required.

Westinghouse Traction Brake Company
General Offices and Works: Wilmerding, Pa.

2123

WESTINGHOUSE TRACTION BRAKES

BALLGROUND
Car
for the
Ball Grounds

Every car speaks for itself

With the ball parks opening and the crowds once more on the move—

With the beaches about to open for the sweltering city hordes—with the vacationists soon swarming the cars to and from the railroad stations fed by your lines—

With all these fares to go into your coffers are you doing your utmost to see that these people reach their destinations via your lines?

Indistinct car markings won't get them all; they'll patronize the first means of transportation advertising the destination points they want to reach.

Get Hunter-Keystone Illuminated Destination Signs on your cars immediately and they'll do the job of announcing your service in no uncertain language.

A Hunter-Keystone-marked car is its own salesman.

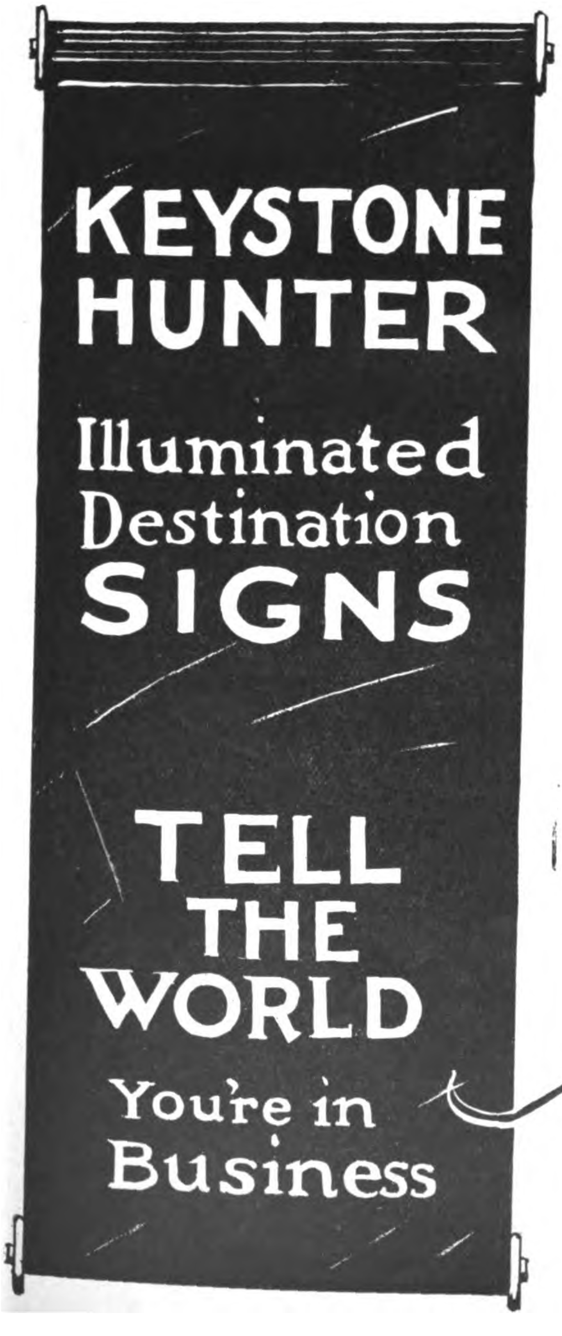
It speaks for itself. Employ this salesman on every car you operate this summer.

Ask for an introduction. We'll arrange it if you'll write for the data sheets.

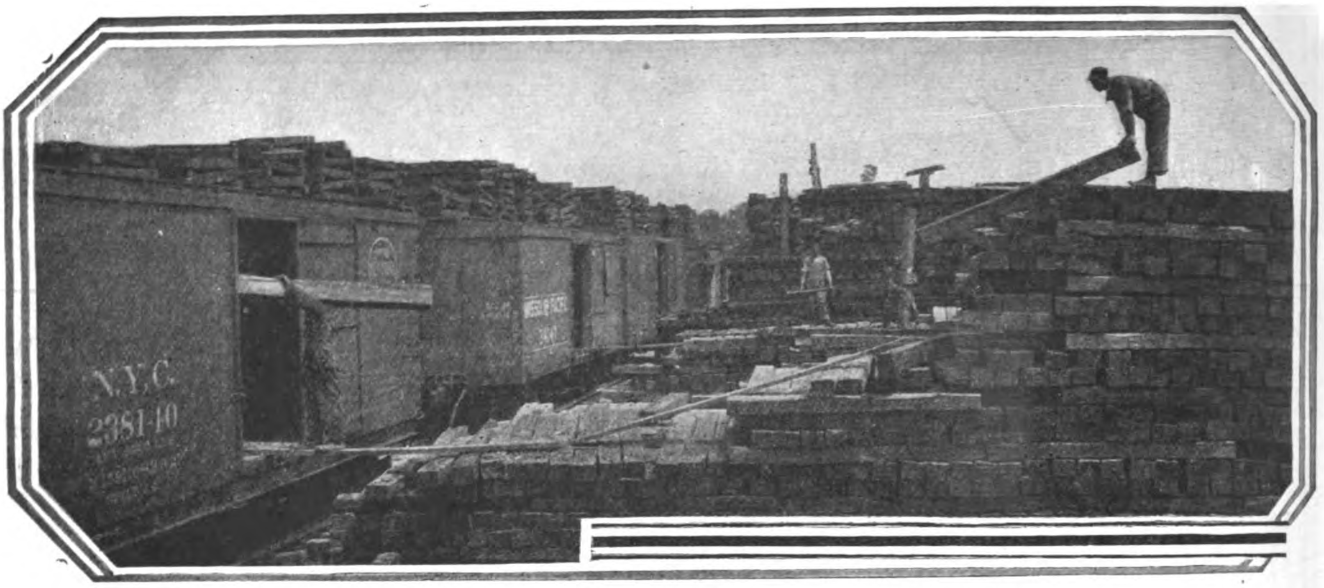
ELECTRIC SERVICE SUPPLIES Co.

Manufacturer of Transportation Specialties and Electrical Supplies

Philadelphia, 17th and Cambria Sts.; New York, 50 Church St.; Chicago, Monadnock Bldg. Branches: Boston, Scranton, Pittsburgh. Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal, Toronto.



An effective advertising medium



The Effect of Known Value

THE growth of any business depends on the satisfaction of its customers, for a company establishes confidence only as it serves; its success depends on how its products endure.

For that reason, ***International*** offers ties of known value to the railroads—it knows that a company is known by the customers it keeps and that the only customers of value to it are those who are satisfied and will buy again.

International knows that its ties will give lasting service and prove satisfactory. To substantiate this belief ***International*** ties are permanently identified by the ***International*** dating nails showing the year in which they leave the plants.

International ties are sound, full size, plainly marked, well seasoned and effectively treated.

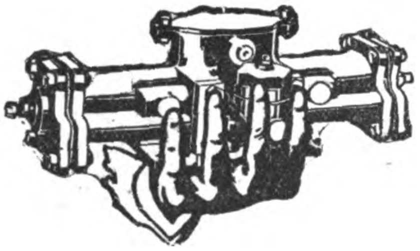
International has gained many friends by conducting a great tie business on a quality basis, by producing ties in accordance with the standard A. R. E. A. tie specifications, and by the faithful, experienced and thorough manner in which it has completed its contracts.

To entrust ***International*** with your tie contract is to guarantee yourself the value of satisfactory service.

Send inquiries to our general office

International Creosoting & Construction Co.
General Office—Galveston, Texas
Plants: Texarkana, Texas Beaumont, Texas
Galveston, Texas

International
Standard Specification
TREATED TIES



No. F-63008

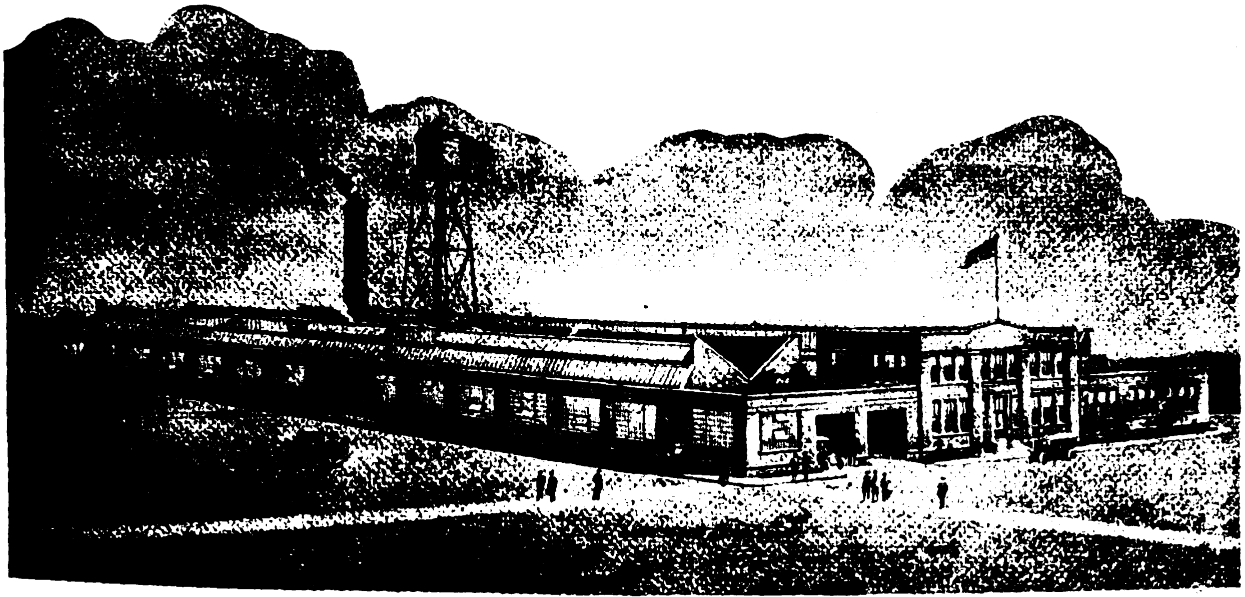
Why every engine has a number

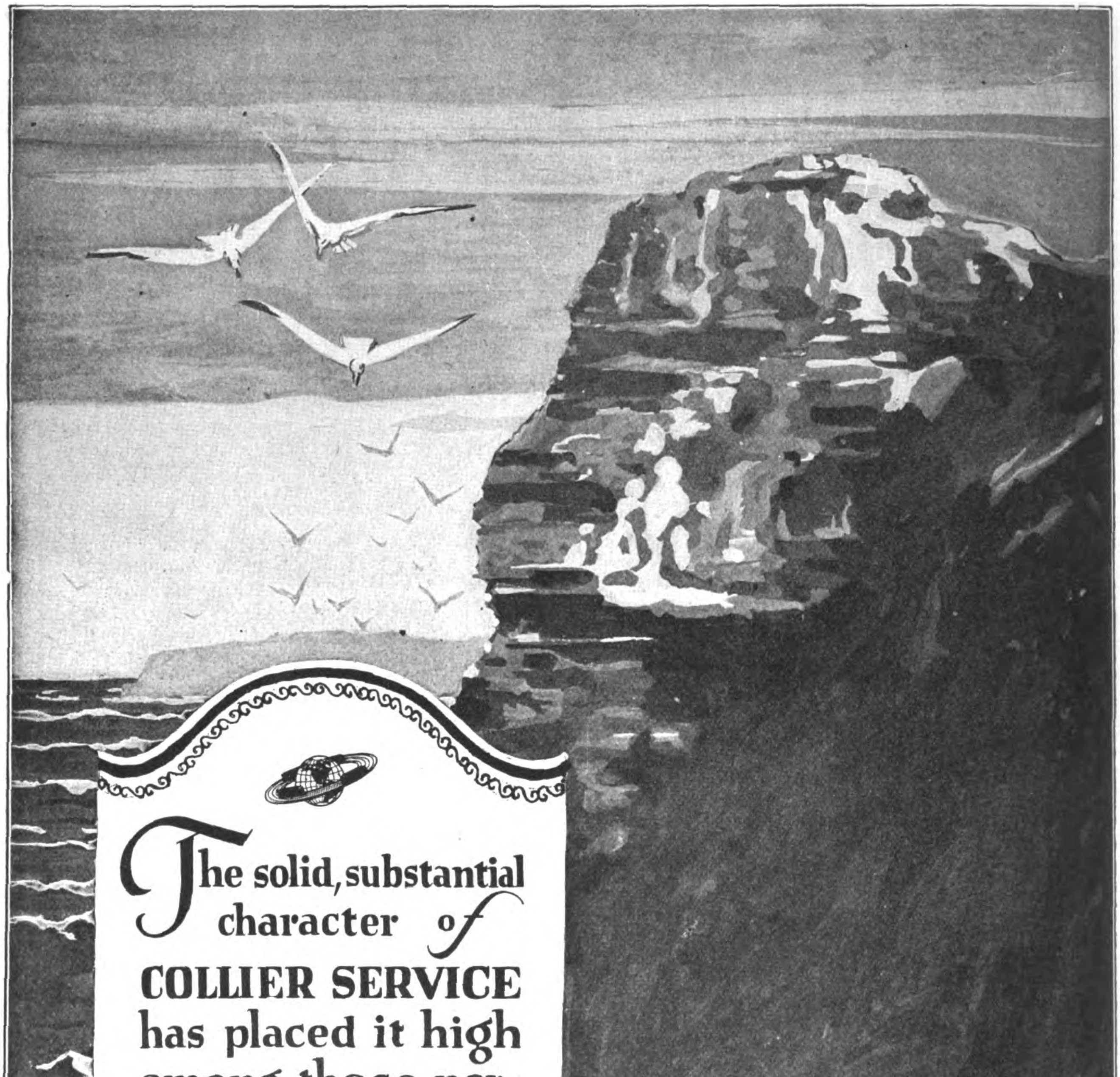
JUST another example of National Pneumatic foresight and service.

The figure shown above was the serial number of a National Pneumatic Door Engine shipped recently. Five years, hence, or ten years the purchaser may want a blueprint or a spare part for this engine. By referring to its serial number our factory at once identifies it with its original drawing and a complete record of its manufacture, inspection and shop test.

National Pneumatic Service is Your
Protection and Guarantee

National Pneumatic Co., Inc.
Originators and Manufacturers
***Principal Office:* 50 Church Street, New York**
Philadelphia—Colonial Trust Building Chicago—McCormick Building
Works—Rahway, New Jersey
Manufactured in Canada by Dominion Wheel & Foundry Co., Ltd., Toronto, Ont.





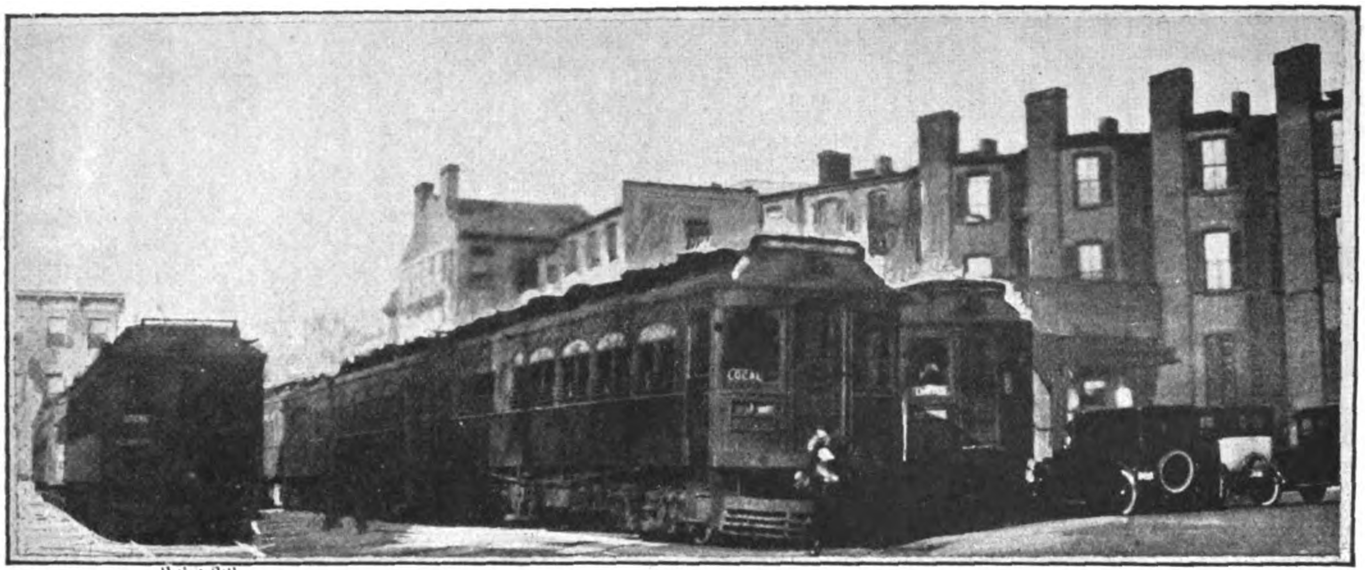
The solid, substantial character of

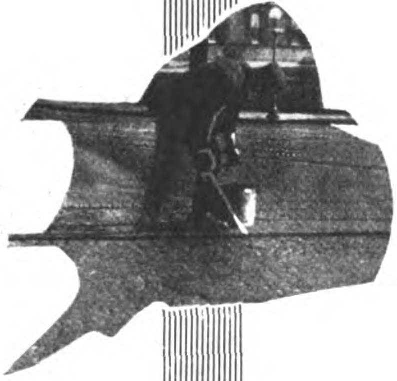
COLLIER SERVICE

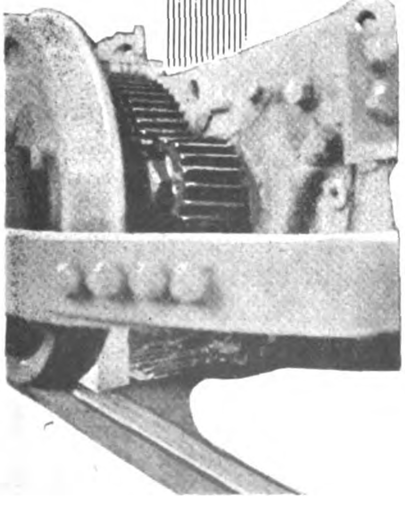
has placed it high among those permanent organizations recognized as National Institutions

Barron G. Collier

INCORPORATED







GALENA

for lubricating efficiency

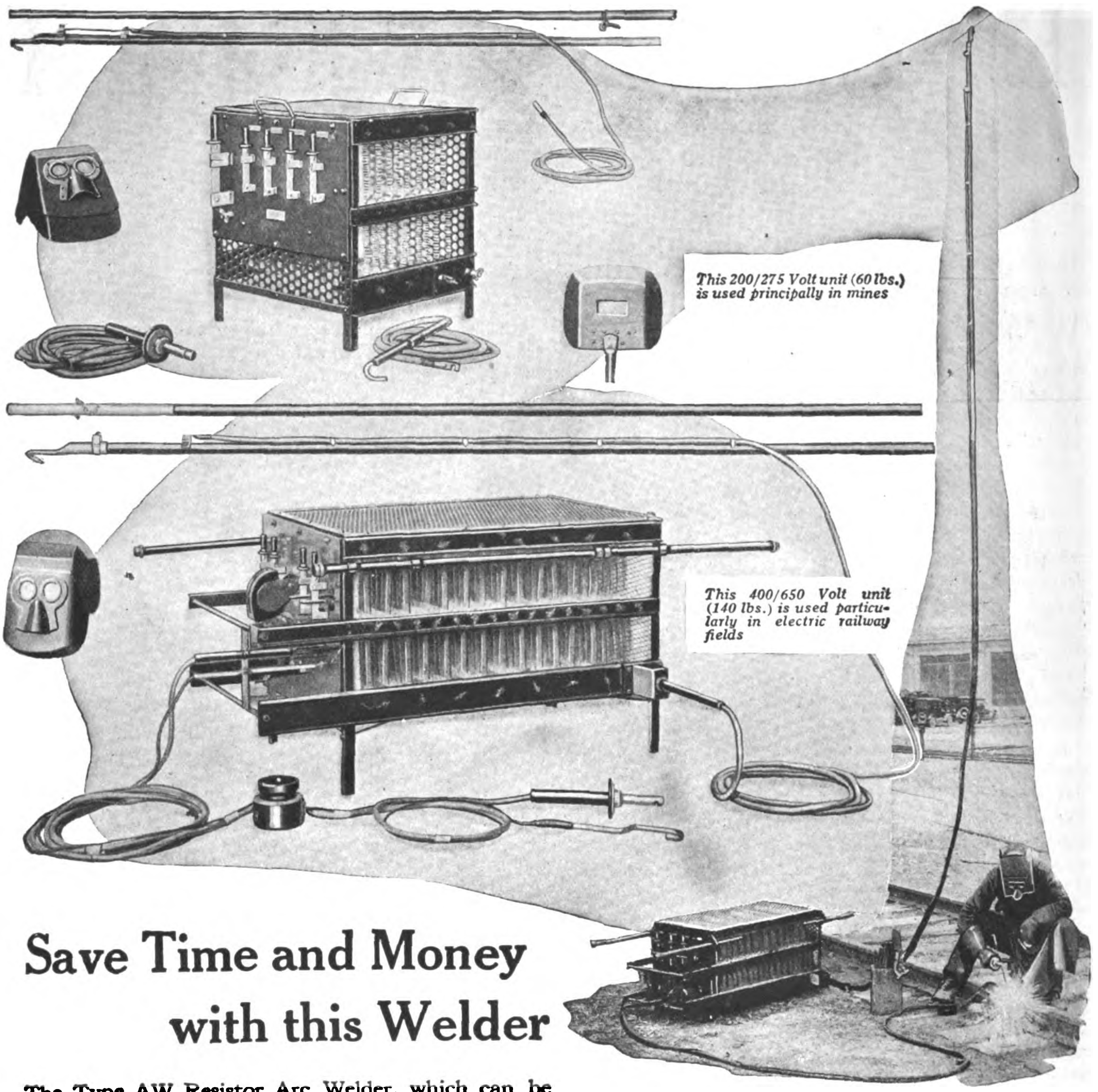
WHEN you use Galena Oils and Greases you stop waste, add life to your equipment, save money and—benefit by Galena Service which embodies whole-hearted, conscientious co-operation. The purpose is to help you get the most for your money.

Galena Service engineers are lubrication specialists, familiar with every type of equipment. Their recommended practices have never failed to produce results in efficiency and economy.

GALENA-SIGNAL OIL COMPANY
Franklin, Pa.
New York **Chicago**
and Principal Cities

Electric Car Oil
Power House Engine Oil
Power House Valve Oil
Turbine Oils
Dynamo Oils
Air Compressor Oils
Track Oil
Gas Engine Oil
Commutator Oil
Electric Generator Oil
Anti-Friction Triple Valve Oil
Air Brake Compound
Gear Greases
Ball Bearing Grease
Roller Bearing Grease
Motor Grease
Trolley Grease
Solidified Oil
Lubricating Grease
Sponge Grease

GALENA -OILS-



This 200/275 Volt unit (60 lbs.) is used principally in mines

This 400/650 Volt unit (140 lbs.) is used particularly in electric railway fields

Save Time and Money with this Welder

Welding rail bond with the Type AW. Note the foot-operated push button station for making and breaking welding circuit at a remote point. This control is optional and can be supplied if desired

The Type AW Resistor Arc Welder, which can be carried by hand and operated from a trolley wire, is a "big hit" in electric railway and mine service.

It is light in weight and is easily handled by workmen.
It does a good job in quick time and at minimum cost.
It withstands the wear and weather.
It is specially designed for the welding of rail bonds, fish plates, etc.

Just hook the Type AW to a trolley wire and you get speedy production combined with low cost of operation. The welding current can be varied by approximately 15 ampere steps from 60 to 200 amperes.

Ask the G-E Sales Office nearest you for complete information on your electric welding requirements.

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

43B-837

GENERAL ELECTRIC

New York, April 26, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

Volume 63
Number 17

Accurate Schedules Demand Accurate Time

WITH steam railroad men accurate timepieces are traditional, and are looked on as a matter of course. Not only are high-grade movements demanded, but the timepieces used in railroad work must be examined periodically by competent inspectors and their accuracy certified.

Some street railway managers are prone to believe that similar accuracy of timepieces is not necessary on their roads. This is on the theory that slight deviations from the schedule are not of prime importance, and that it is the duty of inspectors stationed along the line, along with their other activities, to keep the cars properly spaced and on time.

Headways on a large city system are usually quite close, especially on trunk lines, where a number of routes converge, and it is folly to try to space out the cars on the street if they do not start from their terminals on time. Where the headway is, say, 2 minutes, if a car is 1 minute behind its schedule because the motorman's watch is a minute slow, and the one due next is 1 minute ahead, due to a watch a minute fast, they would run together, and there would be a gap of 3 minutes on either side of them, or 50 per cent above the proper spacing. The car due later might even arrive at the junction first, and so get ahead of its scheduled leader.

A joint headway of 2 minutes is not particularly frequent service, and nearly every American city of any size has at least one such line. The bunching of cars started in this manner is likely to be cumulative. One or two cars off time at the beginning of the rush hour might easily derange the entire service during this period. It is not always unavoidable delays that cause the irregular spacing.

Some roads have a practice, similar to that of the steam railroads, of requiring the men to purchase good watches and have them inspected. While ordinarily street car men do not have a large surplus of funds, a good watch should be considered an essential of the business. Arrangements usually can be made to purchase the watches on the installment plan, and as it is only the quality of movement that matters, the burden is not particularly onerous.

In line with the same policy, standard clocks should be provided at carhouses or other central points, against which the men should be required to check their watches daily, thus synchronizing time on the entire system and preventing any argument as to the correct time. And no alibis should be accepted from trainmen whose watches are inaccurate.

The policy of having the time for a road standardized is just one of the big little things that go to make the difference between good service and indifferent service. As a means of merchandising transportation there is nothing like dependable service, with the cars always on time. Accurate timepieces are the first and a fundamental requisite in such a program.

Railway Conventions for Railway Men

OUR conventions have come to be too much of a character designed to get publicity for the railway man's point of view. While this is desirable to a certain extent, it is somewhat of an imposition on a busy man's time to have to listen to papers and addresses directed not to him, but to the general public, he merely helping to make up the scenery and the occasion for putting this message out to the public.

In this suggestion, there is not the least intention to belittle the importance of good publicity, nor the effort to get all the good out of a meeting, in a publicity way, that can be. But there are ways of doing this without turning conventions for railway men into conventions for the general public; for example, by planning greater publicity for talks of railway men before layman type audiences.

More Outside Point of View Needed

AS ATTENDANTS at numerous railway conventions, the editors of this paper have been impressed with the desirability of bringing in more speakers with an outside point of view. There is a rather natural tendency for railway men to tell each other their problems and consult about them, all from an inside point of view. This is productive of considerable mutual helpfulness, especially with respect to mechanical and operating problems. But on the broader, less tangible problems, such as public relations, they are all attacking them from about the same angle, for their thinking is much along the same lines. They confer, and, agreeing, part without having gained materially.

What would be helpful here, perhaps, would be to have speakers who would present some ideas from the car rider's point of view. Most every layman has ideas on how to run the railway. Some of those ideas, if coming from a man of reputation, might be quite worth the time of a railway man to hear. They might not always make the best publicity—and yet, the railways have nothing to conceal nowadays, and if a condition does exist which would not look well in print, it ought to be corrected anyway, or if it cannot be, then the company doubtless has a reason that will constitute a satisfactory explanation, and the news about the matter would give an opportunity to get that reason before the public.

Would it not be fruitful to invite a prominent newspaper man to speak to a railway convention now and then, even though he might represent an anti-traction paper? Perhaps he would disclose something of his reasons for antagonism—some motive that had not occurred to the railway men. This would then suggest a way to correct a misimpression on his part, or a fault on the part of the railway.

House Organs as Mediums for Railway Publicity

ANOTHER good way to get the story of the local electric railway before a part of the public is to prepare short articles for some of the numerous little publications of the "house organ" type. Almost every large organization nowadays has some sort of magazine which is circulated to the employees. These organizations include manufacturing concerns, department stores, the police department; automobile, golf, political and athletic clubs; federated women's clubs, and so on. Such papers are often in need of an article or two on some good, live topic. And they are not troubled with the general publicity that floods every newspaper office. They may not reach a host of readers, but to their limited audiences they have an especial appeal—that associated with company or club interest and backing. Such mediums are numerous, and taken as a whole, they form a very worth-while means of spreading the true story about railway service.

Giving the Pedestrian a Show Should Benefit the Railway

TRAFFIC problems nowadays are considered principally from the standpoint of the street car and the motor vehicle. The discussion usually comes down to whether the motor car should use the streets to the exclusion of other traffic, or whether the street car should be given precedence over vehicles.

There is, however, a silent sufferer who loses no matter what the decision—the pedestrian. Street congestion is getting so bad in most urban business centers that it is exceedingly difficult for him to make his way across the intersections.

Some cities go farther than to consider the pedestrian a pest. They legislate against him to the extent that he must cross the streets at certain designated points, and then only when the traffic signal is set properly for him. Even so, there are vehicles making right-hand and left-hand turns that interfere with his movement and make it dangerous for him.

A speaker recently pointed out that there is a connection between the street railway and the pedestrian, in that except for the pedestrians on the congested streets there could be no surface car system. Railway managers are importuned to tell the motor car owner to leave his automobile home and ride the street cars. It must not be forgotten that this carries with it a certain obligation to make it safe and convenient for the same person when he leaves or boards the street car, wherever that may be. Certainly if he cannot feel that he is safe afoot, he will prefer to drive his own machine with its attendant risks rather than walk on the streets and take a chance against other vehicle drivers.

With this idea in mind, street railway men can justify time spent in campaigns for public safety, for in so doing they are not only performing a public duty, but they are also working in their own interests. The passage of regulations safeguarding boarding and alighting passengers, the construction of safety zones and loading platforms, elimination of vehicle turns that interfere with pedestrian movement, prohibition of parking at places that make it dangerous for persons going from sidewalk to the car stops, are just a few of the things that can well be sponsored in an effort to popularize service and increase patronage.

If it can be shown, as it repeatedly has been, that the street railway can furnish faster, cheaper and above all safer service than the individual can provide for himself, the ranks of the car riders will be augmented and the coffers of the railway will gain accordingly.

A Subway by Assessment Approved in New York

THE legality of the New York State act of 1909 permitting rapid transit lines in New York to be built through assessments on the property benefited bids fair to be determined soon. The line concerned is the proposed Sixth Avenue subway in Manhattan, construction of which is being strongly urged by the Manhattan borough president. Under his direction, the owners of a considerable part of the real estate immediately abutting on the route have agreed to pay an assessment of 10 per cent on their property to construct the new line. Sanction to the plan has now been given by the Transit Commission, though it points out that a 10 per cent assessment on all the property directly affected would yield only about half of the sum required. The commissions suggests, therefore, either an assessment increased to 20 per cent or to lay some part of the cost on property from half a block to a block on each side of the proposed route. It refers the choice between these methods to the municipal authorities.

Much can be said in favor of the plan of special assessments for rapid transit lines judiciously planned. But any act of this kind also contains an element of danger, which property owners in New York now will more generally recognize since Mayor Hylan can now appoint a board to construct rapid transit lines to be municipally owned and operated. Hence, as any property holder may object to his assessment, it is safe to say that active construction work on the new Sixth Avenue subway will wait until the courts act on some test case.

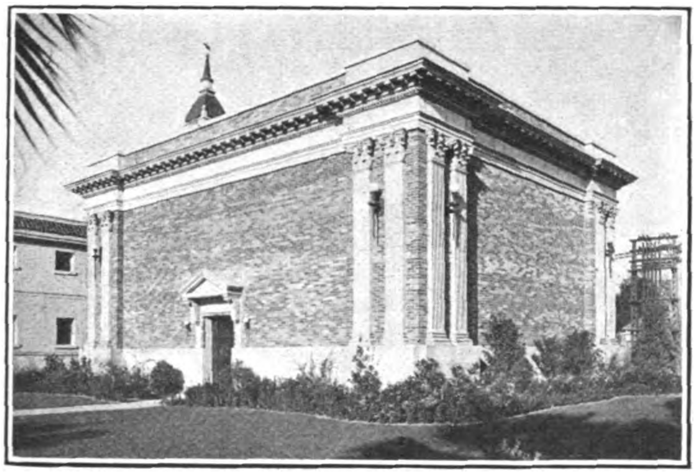
Wisely, the commission's order provides that the present Sixth Avenue elevated railway must remain in place until the new subway is ready to function. In view of the fact that the Sixth and Ninth Avenue lines together now carry over 150,000,000 passengers a year, of which probably at least half use stations exclusively on the Sixth Avenue branch, this was the only decision possible. No new north and south line on Manhattan is under construction, and the present lines certainly could not care for this number of passengers in addition to those now being carried.

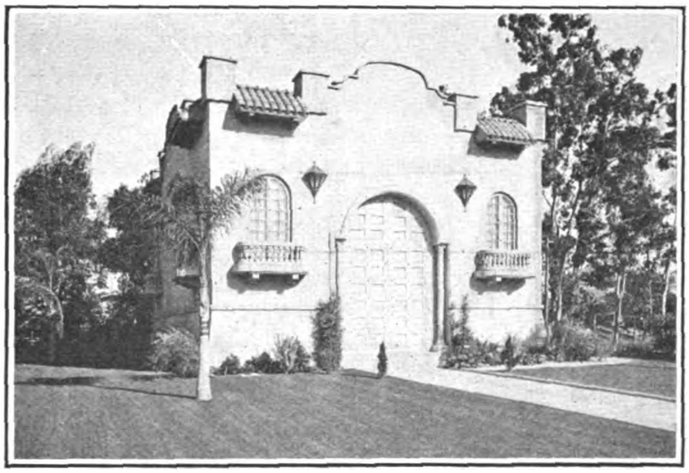
The removal of the Sixth Avenue elevated can be seriously considered only after the proposed Sixth Avenue subway has been built, and then only if the north and south traffic on Manhattan does not increase materially during the five years or more required to build and equip the subway. All past experience shows that traffic in New York increases more rapidly than the facilities. In fact, conditions are becoming so bad on trains and in stations during rush hours that the congestion suggests as a possible necessary early measure that those waiting to be carried form queues and be admitted onto the station platforms only as the trains have capacity to carry them.

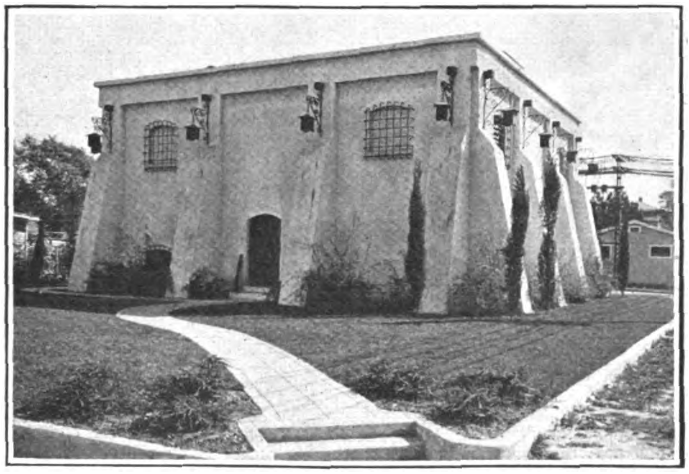
Progress in Noiseless Substation Design

The Los Angeles Railway Has Developed Substation Buildings to Harmonize with Surroundings in Residential Districts—Use of Automatics Has Produced Satisfactory Operating Results and Substantial Economies, Which Are Itemized

By L. J. Turley
Electrical Engineer Los Angeles Railway Corporation







These Designs of Noiseless Substations of the Los Angeles Railway Show the Architectural Treatment. Top, Left—West Adams. Top, Right—Melrose. Bottom—Garvanza

WITHIN the last three years the Los Angeles Railway has placed in service five automatic substations, four of these being 1,000-kw. single units, while the fifth is a double 1,000-kw. installation. A contract has just been closed for the sixth equipment, to consist of a 1,500-kw. automatic set.

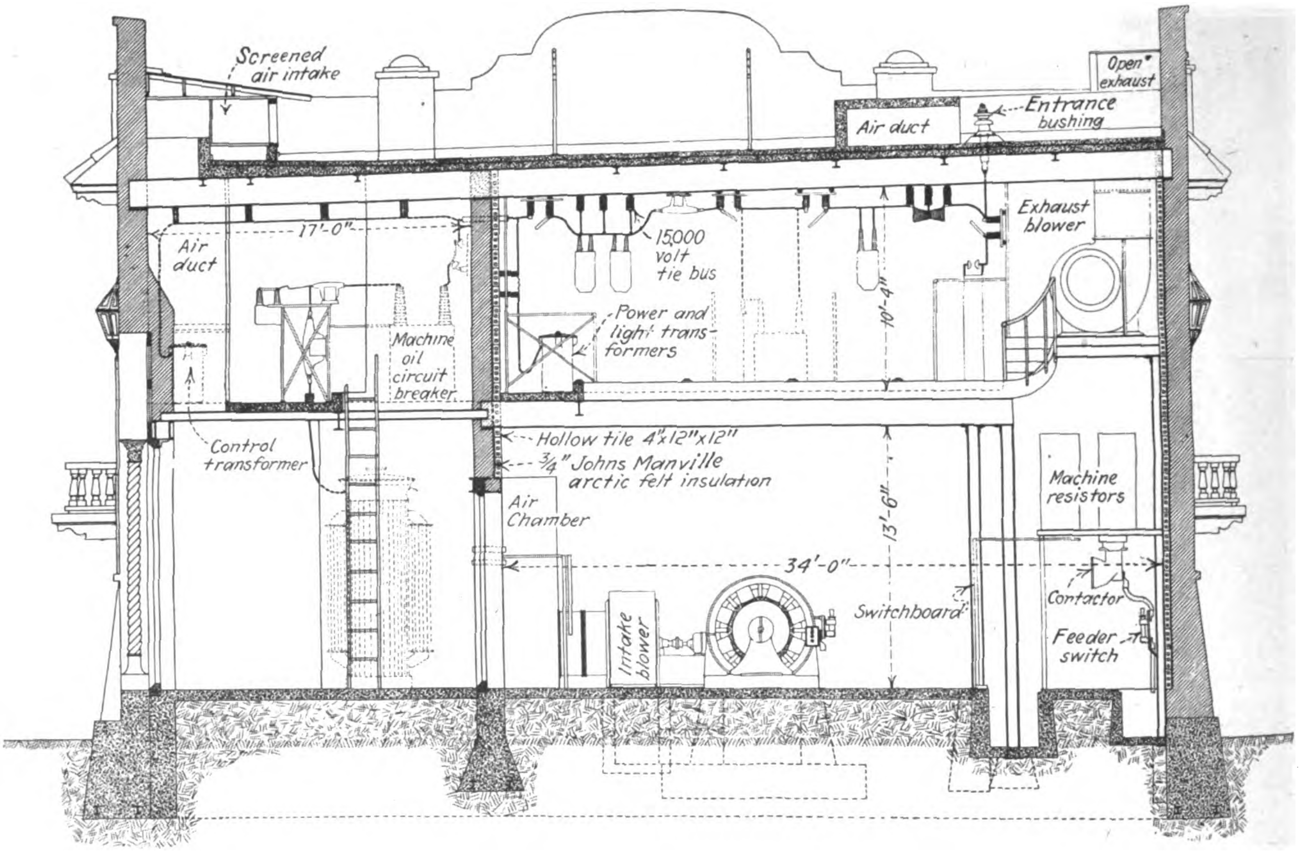
This is a good example of the gratifying trend toward the recognition of the economic possibilities claimed by the manufacturers for automatic control features, applied to one or two units in stations scattered over a spreading trolley system. This claim is now substantiated by the increased number of successful installations on other systems, where a desired reduction in cost of attendance has been obtained, together with a general improvement in power conditions.

The automatic type of substation has now passed the early development stage into economic use. A general degree of confidence seems to exist in its reliability for city and interurban service, and it is satisfactorily meeting every kind of normal or emergency load demand. Where high line switching formerly required the presence of an operator, the remotely controlled supervisory schemes of today have met this requirement.

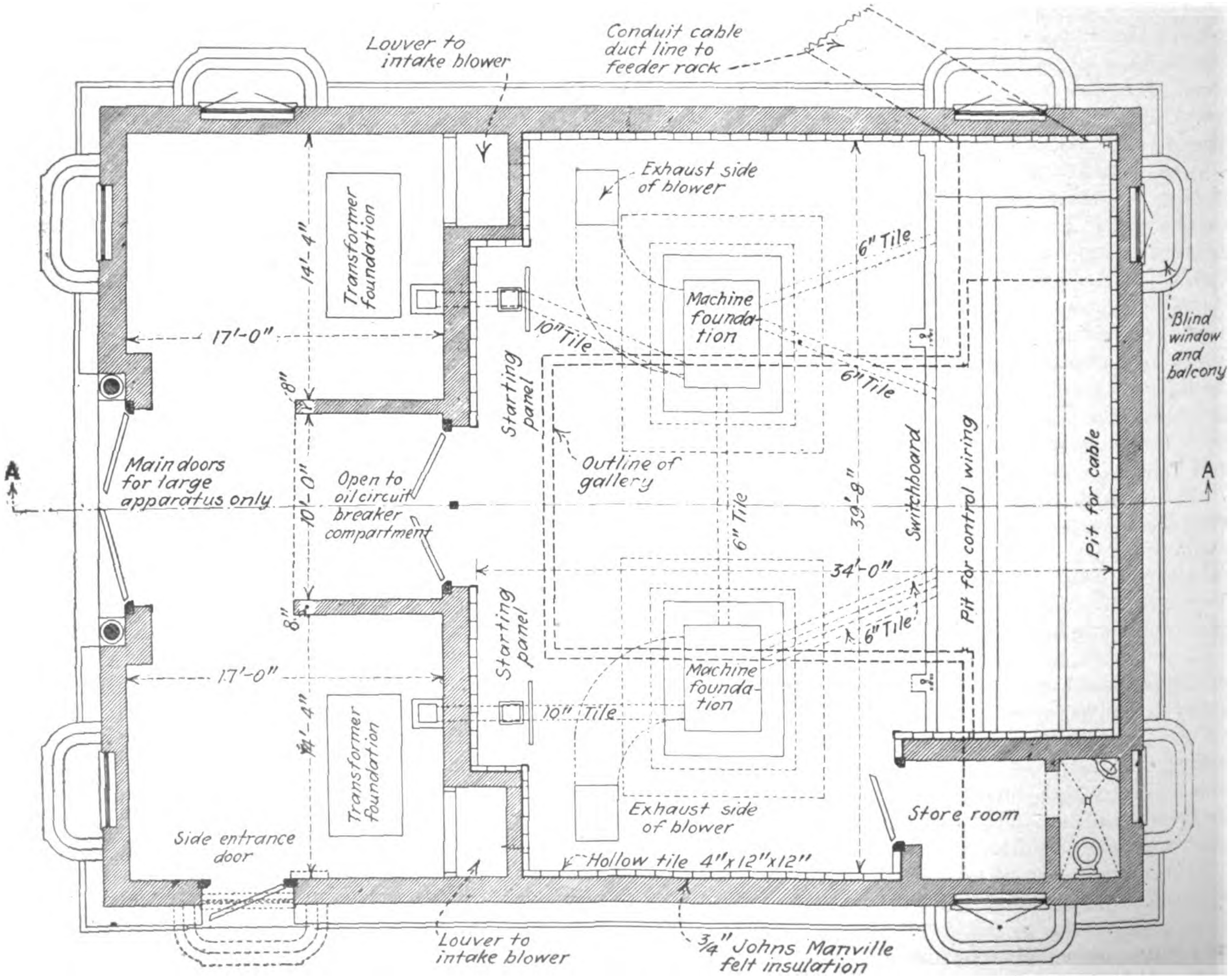
Ordinarily an increase of 6,000 kw. over a three-year period on any large city railway system is unworthy of comment, but due to the timely action of establishing five distinct power delivery points to the overtaxed generating and distributing system of the Los Angeles Railway, and to the favorable and satisfactory operation obtained from the very first installation, the writer considers it of sufficient importance to review briefly the situation that led up to the decision to institute a program involving the construction of noiseless automatic substations.

The redistribution program of 1920 called for several substations in the immediate outlying districts of the city. Without defeating the object of economically serving the entire feeding area, it became necessary to plan the station sites approximately near the established load centers. A problem arose on finding that some of them must be located in restricted residential sections. Realizing that former complaints had been lodged against other stations on account of noise and the unsightly appearance of the buildings, and with due regard for rights of property owners in residential sections, the railway company decided that future substations should be of fireproof structure, unusually attractive, beautifully parked, and with the added feature of eliminating the unnecessary noise which characterizes rotating machines and transformers.

There was a limited amount of available information on sound-proofing applied to substations, and the special conditions imposed novel considerations in combining soundproof construction, forced ventilation, and automatic control operation. Naturally this course would make property and building costs unusually high for 1,000-kw. single-unit installations, but it was considered


Screened air intake
Open exhaust
Entrance bushing
Air duct
Exhaust blower
17'-0"
Air duct
15,000 volt tie bus
10'-4"
Power and light transformers
Machine oil circuit breaker
Control transformer
Hollow tile 4"x12"x12"
3/4" Johns Manville arctic felt insulation
Air Chamber
13'-6"
Machine resistors
34'-0"
Contactor
Switchboard
Feeder switch
Intake blower

The Sectional Elevation of the Melrose Station Shows How Switches and Auxiliary Equipment Have Been Placed Overhead


Louver to intake blower
Conduit cable duct line to feeder rack
Exhaust side of blower
Transformer foundation
14'-4"
6" Tile
Machine foundation
10" Tile
17'-0"
8"
Starting panel
6" Tile
Blind window and balcony
A
A
Main doors for large apparatus only
Open to oil circuit breaker compartment
10'-0"
Outline of gallery
6" Tile
Switchboard
39'-8"
Pit for control wiring
Pit for cable
34'-0"
8"
Starting panel
6" Tile
17'-0"
Machine foundation
14'-4"
Transformer foundation
10" Tile
Exhaust side of blower
Store room
Side entrance door
Hollow tile 4"x12"x12"
Louver to intake blower
3/4" Johns Manville felt insulation

Floor Plan of the Melrose Station, Which Has Two Units and Separate Air Supply for Each Machine

TABLE I—BUILDING DIMENSIONS AND COSTS

	Kw. Capacity	Building Dimension	Square Feet of Building Area	Cubic Feet Machine Room	Air Changes Cubic Feet per Minute	Real Estate	Building and Foundations**	Complete with Equipment
Garvanza.......	1,000	43 x44′	1,892	26,000	9,000	$953	$17,915	$74,806
Melrose.........	2,000	39 x52	2,128	33,000	30,000	7,398	26,280	109,056
West Adams....	1,000	35 x44′	1,540	20,000	15,000	5,019	25,150	74,140
West 54th......	1,000	35 x41′	1,435	21,000	15,000	*	21,230	68,255
Central Ave.....	3,000	45 x54′	2,430	36,000	40,000	*	Under construction.	

* On division carhouse property.
** Cost include parking, lighting, cable duct lines.

an asset in public good will, together with the improvements sought in giving better service with a shorter feeding area.

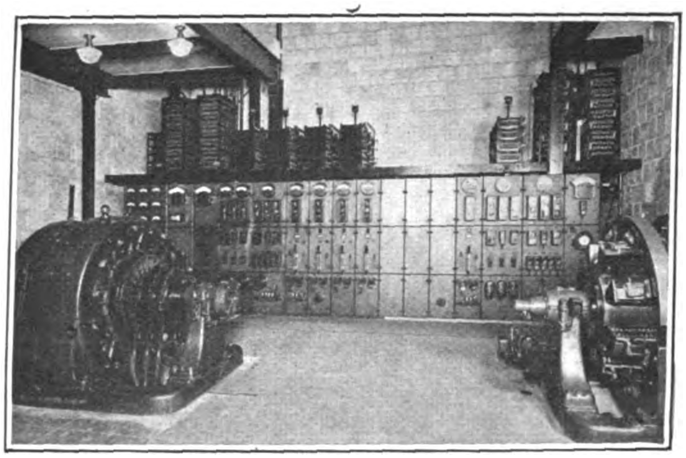
Regardless of the company's good intentions, two districts filed petitions of protest to the City Council, with emphatic objections to granting the railway's application, basing their claim on the ground that the architectural harmony of the district would be marred and property values decreased, noise or no noise. The railway realized the importance of rendering increased car service to the entire district, even in view of the protestants declaring the existing service satisfactory. After a year's delay the city granted the application, having been satisfied with the company's first attempt with the Garvanza substation. The ELECTRIC RAILWAY JOURNAL of July 8, 1922, contains a description of this station. Due to the improvements in arrangements and soundproofing in subsequent substations, it is considered of sufficient importance to present an abstract description of the building construction, together with views and plans, showing the accomplishment.

Each automatic substation is located in a district corresponding to its name: Vernon, Garvanza, Melrose, West Adams, West Fifty-fourth Street, and the proposed Central Avenue station. These are all indicated on the accompanying map, along with the manual substations. All are of soundproof design, except the one in Vernon industrial district. The following description is confined to those of noiseless design.

Incidentally, the addition of these substations did not permit any reduction in copper feeder cable, but actually required considerably more. This demonstrates the low voltage existing on the extended lines and the great dependency being placed upon the additional power delivery. Table I gives the general inside dimensions and costs. In addition to the original design of the building, all arrangements of apparatus and installation were made by the engineering department of the Los Angeles Railway.

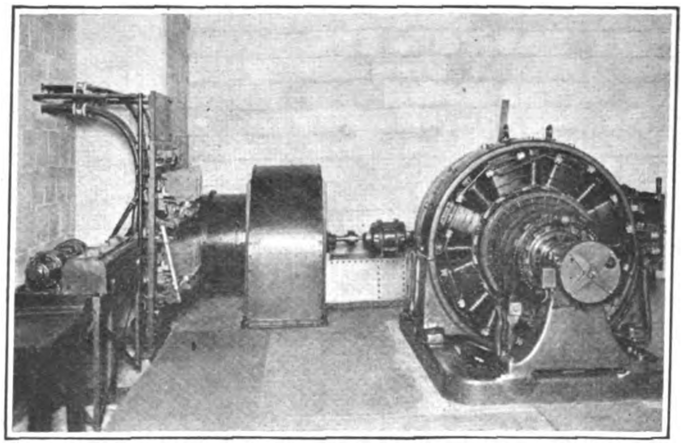
TABLE II—OPERATING CHARGES

	Monthly Average per Substation							
	Repairs to Equipment		Labor of Operators		Supplies		Total	
Year	Automatic	Manual	Automatic	Manual	Automatic	Manual	Automatic	Manual
1922	$9.94	$131.13	$83.16	$564.44	$16.07	$20.75	$109.17	$716.32
1923	1.73	90.01	78.17	563.47	4.91	23.30	84.81	676.78
	Monthly Average per 1,000 Kw. Capacity							
1922	$9.94	$52.77	$83.16	$227.14	$16.07	$8.35	$109.17	$288.26
1923	1.73	36.22	78.17	226.75	4.91	9.37	84.81	272.34



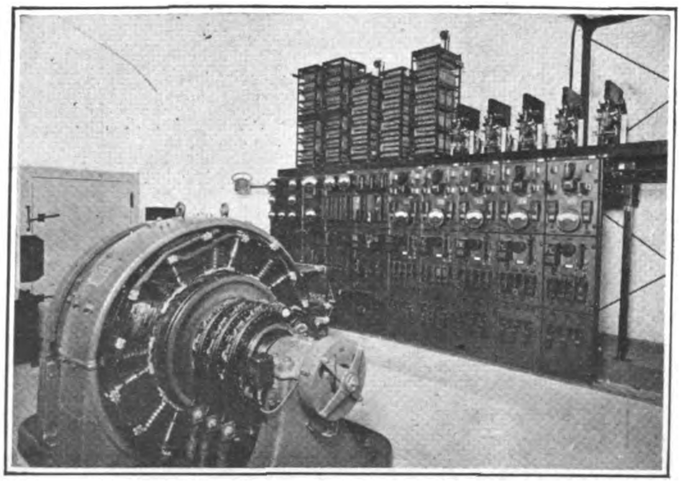
The Machine Room of the Two-Unit Melrose Substation. The Air Outlets Are Above the Grid Resistors

All substations have fireproof compartments for oil switches and transformers. There are no basements except a 2-ft. x 3-ft. pit located back of the switchboard, which is used for incoming underground feeder cables to facilitate the control wire connections at the base of the panels. As may be observed from the elevation of Melrose substation, a gallery is mounted over the machines for the indoor lightning arresters and 15,000-volt bus and switches. This plan is used with the two-unit, or high line installations.

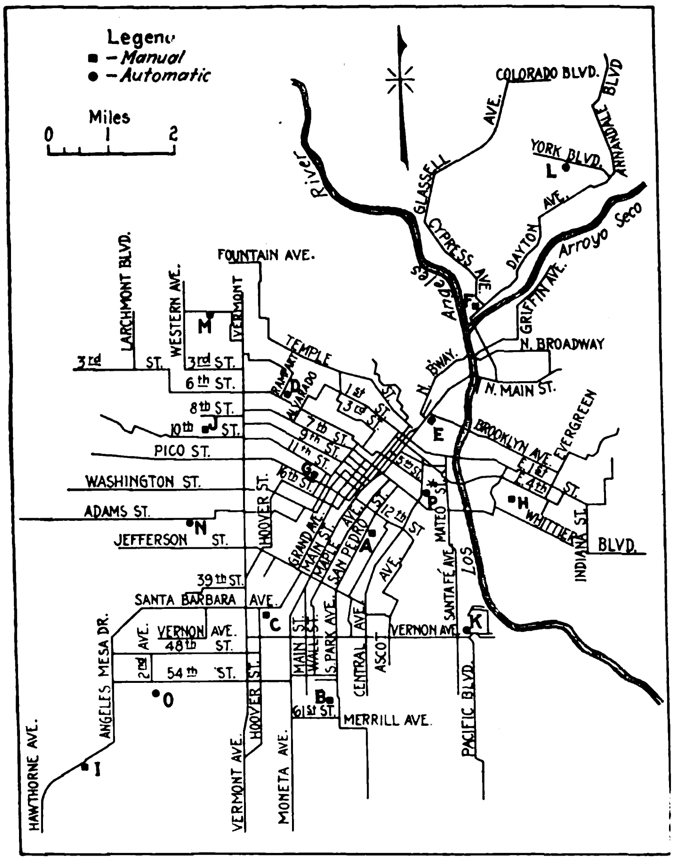


Intake Blower of the Melrose Substation

The hydro-electric system of the Southern California Edison Company supplies all the 15,000-volt power used by the Los Angeles Railway. The high-tension lines interconnecting with substations are owned by the railway company, and are three phase 50 cycle, 15 kv. to

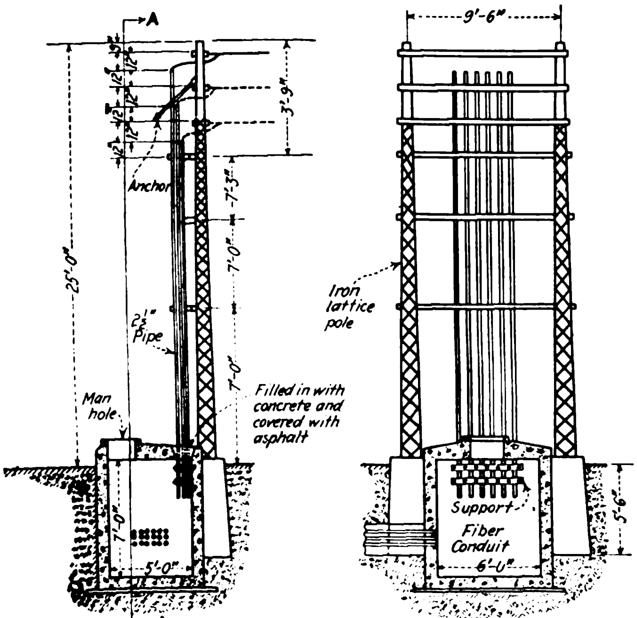


The Entrance to the Machine Room of the West Fifty-fourth Street Station Is Through a Refrigerator-Type Double Door


Legend
■ - Manual
● - Automatic
Miles
0 1 2
COLORADO BLVD.
ANNANDALE BLVD.
YORK BLVD.
L
GLASSELL AVE.
River
CYPRESS AVE.
DAYTON AVE.
Arroyo Seco
GRIFFIN AVE.
Los Angeles
N. BROADWAY
N. MAIN ST.
BROOKLYN AVE.
EVERGREEN
E. 1st ST.
E. 4th ST.
WHITTIER BLVD.
INDIANA ST.
E
H
FOUNTAIN AVE.
LARCHMONT BLVD.
WESTERN AVE.
VERMONT
M
TEMPLE
3rd ST.
6th ST.
8th ST.
10th ST.
PICO ST.
WASHINGTON ST.
ADAMS ST.
JEFFERSON ST.
N
HOOVER ST.
39th ST.
SANTA BARBARA AVE.
C
VERNON AVE.
48th ST.
54th ST.
2nd AVE.
O
ANGELES MESA DR.
HAWTHORNE AVE.
I
VERMONT AVE.
HOOVER ST.
MONETA AVE.
GRAND AVE.
MAIN ST.
MAPLE AVE.
SAN PEDRO ST.
A
P
MATEO ST.
SANTA FE AVE.
CENTRAL AVE.
ASCOT
VERNON AVE.
K
S. PARK AVE.
WALL ST.
B
61st ST.
MERRILL AVE.
PACIFIC BLVD.
D
G
F
J

The Locations of Both Manual and Automatic Substations Are Shown in the Route Map of the Los Angeles Railway

Symbol	Name	Number of Machines	Capacity
A	Sixteenth Street	4	3,600
B	Slauson	3	1,600
C	University	4	4,200
D	West Lake	3	1,400
E	Plasa	5	6,000
F	Huron	3	1,600
G	Sentous	3	2,600
H	Soto	3	1,800
I	Centinella	3	650
J	Ardmore	2	1,600
K	Vernon	1	1,000
L	Garvansa	1	1,000
M	Melrose	2	2,000
N	West Adams	1	1,000
O	West Fifty-fourth Street	1	1,000
P*	Central Avenue (proposed)	2	3,000


A
9'-6"
3'-9"
Anchor
7'-3"
25'-0"
7'-0"
2½" Pipe
7'-0"
Iron lattice pole
Filled in with concrete and covered with asphalt
Man hole
7'-0"
5'-0"
A
5'-6"
Support
Fiber Conduit
6'-0"
Section A-A

Standard Feeder Rack and Manhole for Los Angeles Automatic Substations

TABLE III—DATA ON OPERATION AND FAILURES

Year	Number of Substations	Substation Days	Average Daily Kw.-Hours	Daily Hours Operator Present	Actual Time Station in Service	Average Daily Minutes Lost Due to: Regular Inspection	High D. C. Voltage	Men Working	Equipment Failures	Total
1922	3	425	10,200	3.20	93.1%	39	15	22	4	80
1923	3	1,095	13,900	2.20	97.7%	24	10	7	2	43

Year	A. C. Interruption per Substation	Number of Equipment Failures: Garvansa	Melrose	W. Adams	Total	No. of Device Giving Trouble: Garvansa	Melrose	W. Adams
1922	41	8	2	2	12	21.33	69	133
1923	79	1	6	7	14	64.69 7	7.28.66	7

16 kv., aerially constructed with single line to each automatic station for the present. Provision is made at two substations for double high line entry when necessity warrants. Indoor oxide film lightning arresters and choke coils are installed at each station, except at two, which are of the outdoor type. The main-line 35,000-volt oil circuit breakers are automatically and electrically operated and controlled for undervoltage and overload, with sufficient disrupting capacity to care for short circuits.

METHODS OF ELIMINATING NOISE

The soundproofing feature is used in the machine room only. The ordinary brick walls seem sufficient to prevent transmission of the transformer hum to the outside. Around the machine foundation is placed ½-in. elastite insulation, separating it from the substation 6-in. cement floor to deaden the vibration of the machine. Without any windows or steel frame work penetrating the walls or ceiling, the absorption of the noise developed within the building is obtained by use of the Johns-Manville ¾-in. Arctic insulation placed in layers between the ordinary hollow building tile facing and the 21-in. brick wall. The felt and tile are held securely fastened to the brick with large nails. The ceiling is made up of a 4-in. slab of reinforced concrete mixed with Truscon waterproof paste, on top of which is laid one layer of ¾-in. Arctic insulation, which is covered with an additional 3-in. slab of waterproof concrete.

With all doors 6 in. thick properly constructed with heavy beveled jambs, felt lined and held securely closed to a tight fit by Glockler refrigerator door clamps, the soundproof feature has been such a success that two of the substations were placed in operation and running for some days before any one in the neighborhood was aware of the fact, and then only from seeing the exterior lighting of the building at night and inquiring "when the noise was to start." Although one might detect a slight rumble when in close proximity to the outside wall, yet at 3 ft. distance no noise of machine, transformer or rushing air is noticeable against extraneous disturbances. As with the West Fifty-fourth Street station, a double door is used where entrance is planned from the outside direct into the machine room. Property values are advancing, and many new residences have been constructed since these stations were started.

The exterior view of Melrose shows blind windows with balconies. With a row of 10-watt lamps placed in a recess back of the amber colored glass, the lighting effect at night is similar to that with a drawn shade, as may be observed in the surrounding dwellings. This class of exterior design, with parking arrangements of shrubbery and automatic sprinkling system for lawn, as shown by the views, may not be necessary in every case. This is true of the West Fifty-fourth Street station, but still the principle of sound absorption used in this type of construction will be found satisfactory where such an installation is considered.

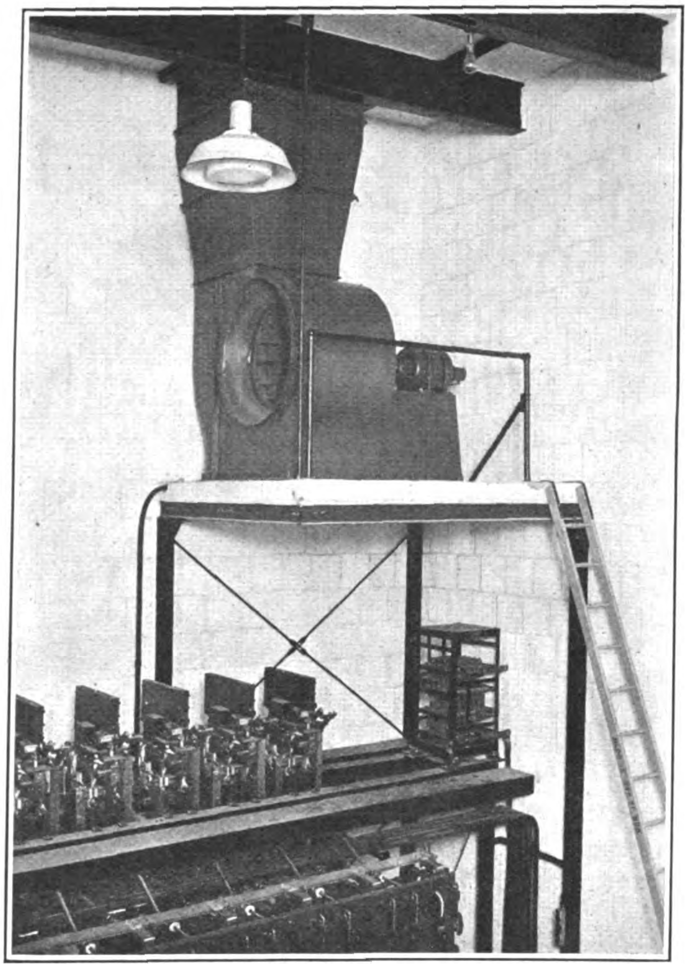
The Central Avenue station will have the added feature of an air washer scheme. This was felt to be necessary, since several failures due to poor contacts of relays have been attributed to dust accumulation, where automatic substations are located in a dusty district. The floors of all the transformer and oil switch compartments are provided with drainage to an outlet for oil in case of explosion or fire. A suitable number of fire extinguishers are conveniently located throughout the building.

FORCED VENTILATION IS USED

The ventilating scheme for Melrose, as for the other forced-draft stations, is as follows: The air is drawn into the transformer room from the roof by way of a large duct, with 20 to 30 sq.ft. area. This duct is covered on the roof by a housing screened on the sides to prevent rain and large particles from entering. An attempt is made to filter the air in its passage by use of a removable tray covered with large mesh screen on which is laid one layer of cheese cloth. The air is drawn into the transformer room past all sides of the three-phase transformer, thence through a large fireproof louver, and forced into the machine pit by a Sturtevant No. 90 silent vane fan, directly connected to a 3-hp., 40-deg., 600-r.p.m. motor. The air in the machine and switchboard room is drawn up by a similar blower located near the ceiling, thence to the roof through an air duct, which extends out on the same plane with the roof, doubling back on itself. This exhaust duct is constructed along acoustic principles by baffling the noise of the machine and rushing air, yet not unnecessarily increasing the static pressure.

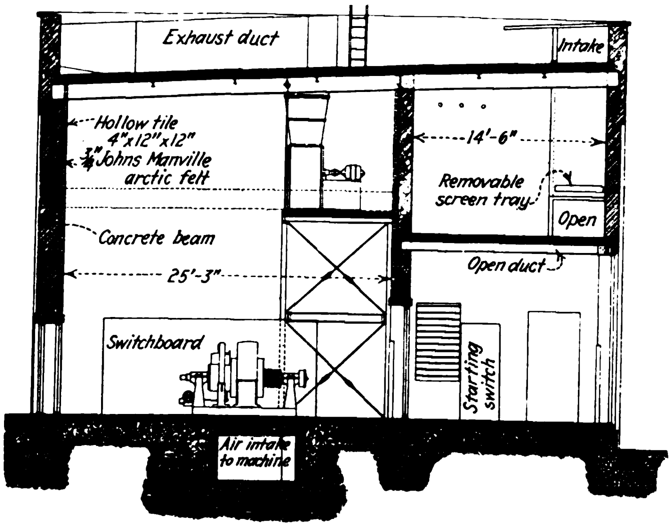
The grid resistors used in the station for machine and feeder control are located directly under the exhaust fan, so that hot air rises quickly in case the grids are connected into the circuit. Melrose has about 33,000 cu.ft. in the machine room, and being a double unit the air is changed in this station, with both units in service, approximately every minute. The 2-min. rate of change is about correct for the southern California climate to maintain proper transformer and machine room temperature for the 1,000-kw. installation on a 65 per cent load factor. Unless precautions are taken in locating the feeder resistors, it becomes necessary, as with the West Adams station, to provide an auxiliary exhaust blower of about 8,000 cu.ft. to care for the hot air, and to permit cooling of the feeder grids in the shortest possible time consistent with load conditions.

The blower motors are started up and operated with the machine. Provision is made for them to cut out 10 to 15 min. after the machine is shut down. They are equipped with an underspeed relay, which will shut down the machine in case either of the motors fails to come up to speed, or blows the main line fuses. These motors are fed from a three-phase bank of separately connected transformers. A throw-over switch in the motor circuit permits operation of the converter, independent of the blower motors.

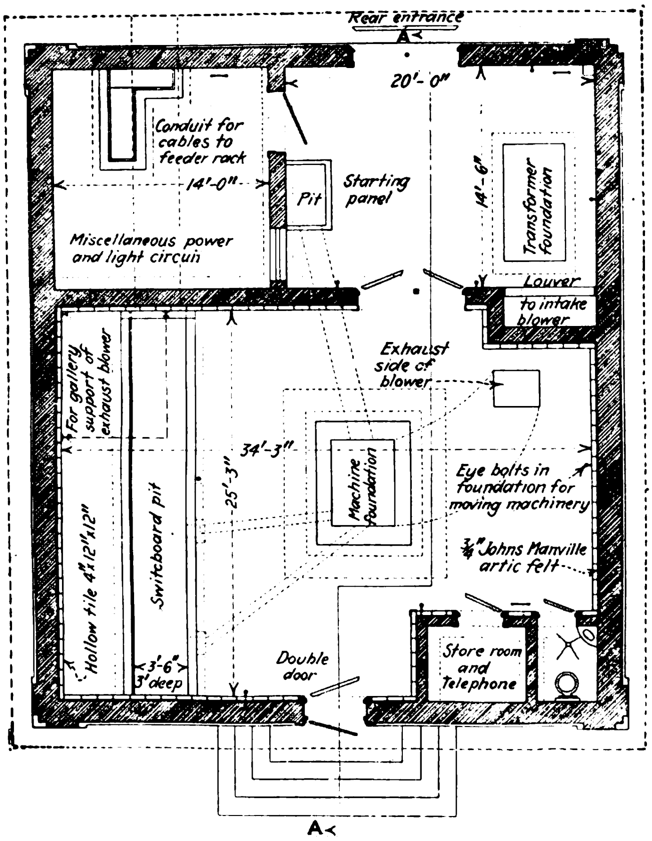


In the Fifty-fourth Street Substation the Exhaust Blower Is Mounted Above the Switchboard

Up to date each of the soundproof substations is equipped with General Electric apparatus. This gives greater interchangeability of parts. The 1,000-kw. synchronous converter has a 200 per cent overload rating for 2 hr. It is flat-compounded, with high reluctance interpoles and without flash barriers on either end. The transformer is three-phase, oil-cooled, with four 2½ per cent taps on the high-tension winding below 16,500 volts. The 1,500-kw. unit on order for Central



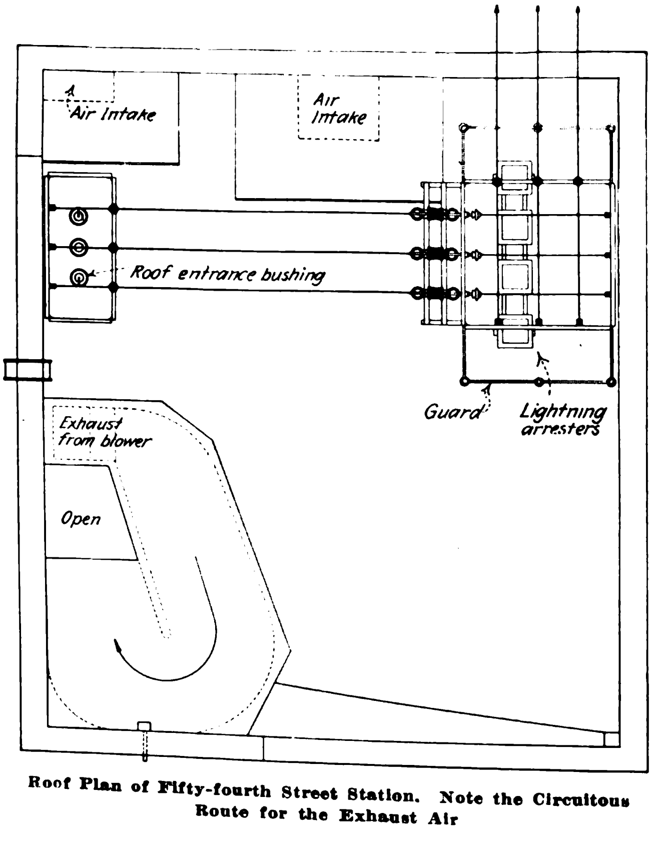
Vertical Section A-A of Fifty-fourth Street Station, Showing Air Intake and Exhaust


Rear entrance
A<
20'-0"
Conduit for cables to feeder rack
14'-0"
Pit
Starting panel
14'-6"
Transformer foundation
Miscellaneous power and light circuit
Louver to intake blower
Exhaust side of blower
For gallery support of exhaust blower
34'-3"
25'-3"
Machine foundation
Eye bolts in foundation for moving machinery
¾" Johns Manville artic felt
Hollow tile 4"x12"x12"
Switchboard pit
3'-6" 3' deep
Double door
Store room and telephone
A<

The Floor Plan of the West Fifty-fourth Street Substation Shows Arrangement for a Single Unit

Avenue station will have flash barriers on the d.c. end only.

All substations have current-limiting resistors for the machine current, while for the positive feeders resistor control is used in three stations, with the high-speed circuit-breaker type for the latest two constructed. There are usually four positive 600-volt feeders in each substation, with provision for an ultimate capacity of eight. This number is due to the extensive trolley sectionalizing policy of this company.


A
Air Intake
Air Intake
Roof entrance bushing
Guard
Lightning arresters
Exhaust from blower
Open

Roof Plan of Fifty-fourth Street Station. Note the Circuitous Route for the Exhaust Air

All feeder cables leave the switchboard through a pit to underground fiber conduits, which extend from the inside of the substation about 50 ft. to a feeder rack; thence aerially to the overhead trolleys. This is shown in one of the illustrations. The feeder rack was considered a better means to take care of the cables on leaving the building, since it permits the building to be unattached and adds to the outside appearance. There are but two stub-end feeders out of a total of 24, all the rest being tied in with manually operated substations. Each feeder has a d.c. electrolytic lightning arrester without choke coils. The insulated negative feeder scheme is used extensively with these stations for reducing rail potential gradients and minimizing the effects of electrolysis.

The control and protection for all machine and resistor-type feeders follow the standard General Electric methods. The feeder control bus is energized at all times, whether the machine is running or not. However, there are two special means of meeting conditions. One multiple-end feeder is provided with a reverse-current relay, so that it will be disconnected from the station bus in case of reverse feeding. It is automatically reclosed when the outside trolley voltage is lower than the station bus, so that this feeder is usually disconnected from the station during the period when the machine is off the line.

The West Fifty-fourth Street d.c. reclosing feeders are equipped with high-speed circuit breakers. These are provided with the standard General Electric auxilary feeling out control with the added feature used with the manually-operated stations in handling grounded trolley wires. At the instant of a grounded trolley wire, the high-speed breaker opens the circuit. The auxiliary feeling out detects whether the existence of the grounded wire warrants keeping the feeder open. At the end of a 10-sec. period, if the feeder is cleared of ground, normal service is resumed, but if at the end of 10 sec. the ground still exists, then the feeling out is delayed a predetermined time, usually 10 min., before an attempt is made to detect outside conditions. This process is repeated in the same sequence until normal conditions are established. A considerable amount of trolley wire has been saved from being annealed. There also is the important consideration of the safety of traffic, and trainmen are enabled to clear the wire from ground without fear of hazard.

TIME SWITCHES CONTROL HOURS OF SERVICE

The machine is controlled by a time switch set for about 18½ hr. per day, including Sunday. This switch gives a definite starting and stopping period, and in addition prevents starting up of the machine due to low voltage during the early morning period. Another time switch controls the exterior lights from sundown to midnight. No scheme is included for remote indication telling when the machine is on or off, or any method of remote supervisory control. Some improvement in this matter is contemplated shortly. To provide means of determining the nature of any abnormal conditions, there is being considered for each automatic substation a graphic strip chart meter, showing the total machine ampere load and bus voltage, together with two special pan attachments to indicate by short movements on each edge of the chart whenever certain contactors in the machine circuit operate. This seems to be about all that is necesary in the way of recording instruments.

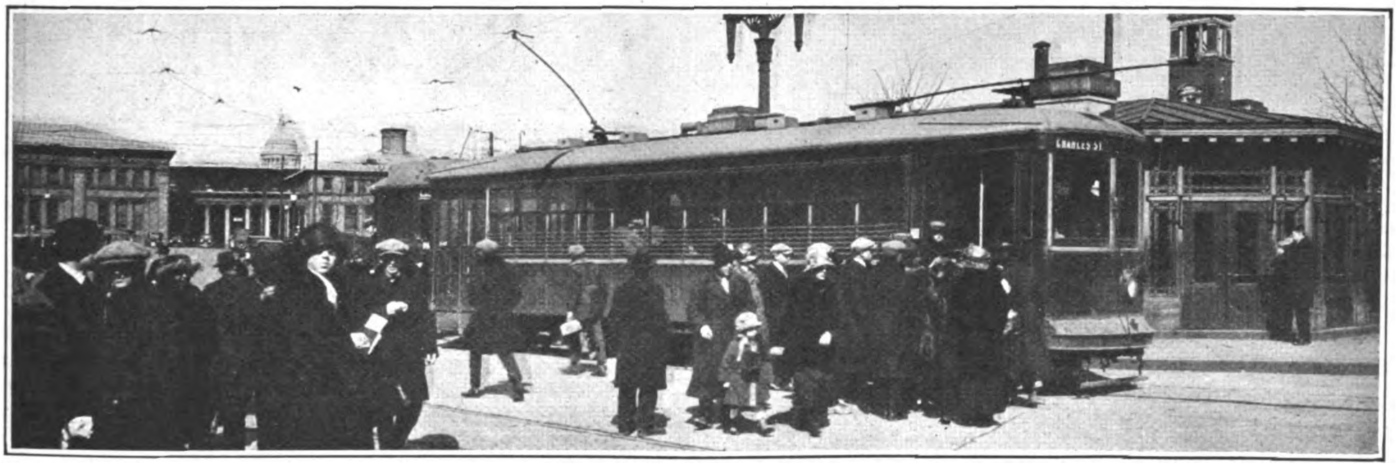
Table II shows average operating charges, comparing the automatic and manual stations; while Table III gives operating data. Due to greater familiarity with the control and equipment by the attendants, the duration of failures has been reduced for 1923. The attendant in charge is subject to call at all hours. He is furnished a roadster for inspection or emergency duty and is required to live in the city.

The scheme of inspection is as follows: The machine is blown out and cleaned twice a week. The a.c. and d.c. brushes are inspected and the commutator slots cleaned once a week. A general substation cleaning of all 15,000-volt insulators, bus and transformers, together with necessary inspection and adjustment of relays, is made once a month. It will take the time of two attendants to care for inspections of six automatic substations, with one helper during the general cleaning up.

With 15 to 24 months operation of these substations, there has been no case of a flash-over on the d.c. or a.c. end of the synchronous converters, although there have been more than 120 a.c. interruptions and many trolley breaks.

Looping Back Reduces Delays by 28 per Cent

The Downtown Rerouting Recently Inaugurated by the United Electric Railways of Providence, R. I., Has Speeded Up the Car Service and Reduced Congestion—At the Same Time a Change Was Made in the Method of Fare Collection



A Loading Point on Loop No. 1, Exchange Place, Which Is Used by Cars Entering Providence from the North

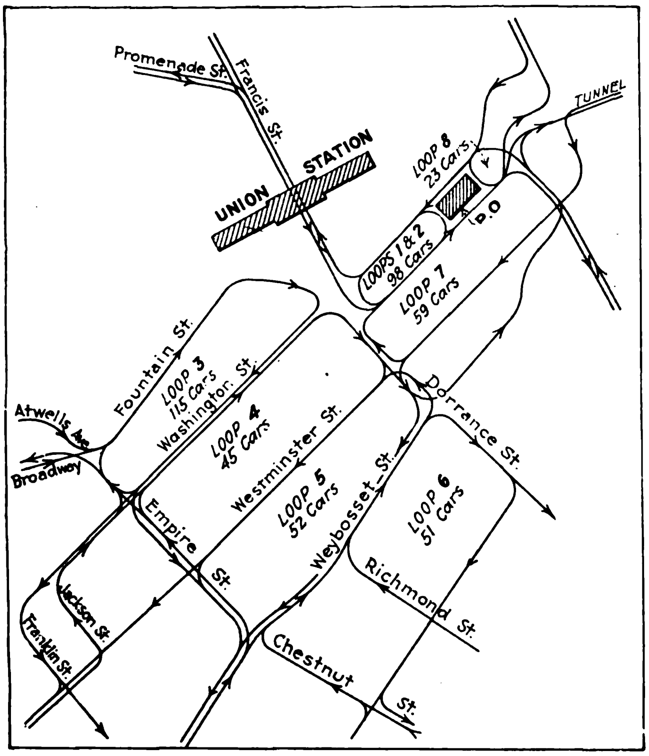
BEGINNING on Sept. 9, 1923, all lines operated through the business district by the United Electric Railways of Providence were discontinued and all cars entering the business district were routed around eight loops. This change reduced from 16 to 3 the number of points where straight railway crossing movements take place in the congested area. Points where left-hand turning movements occur were reduced from 12 to 6, while the number of right-hand turning points remained constant. As a result of these changes there has been a reduction of 28.4 per cent in the number of cars late as compared with the corresponding period the previous year.

There were formerly 35 car routes in Providence, of which 12 were through routes and 23 terminated in the business district. The first step leading to the change in routing was a comprehensive traffic survey by Ford, Bacon & Davis, Inc., covering a period of three months. This investigation showed that the number of passengers actually riding through the business section was less than 5 per cent of the total railway traffic in Providence.

Many of the streets in the business district are narrow and winding. Although in the newer sections of the city there are broad straight streets, on approaching the old part of the town these all feed into a few narrow thoroughfares. During the rush hour there was extreme congestion of vehicles and street cars. Formerly the car routes crossed each other at many places, and cars were forced to make turning movements against a heavy flow of traffic in the opposite direction. The result was that the speed of operation was slow and interruptions to service were frequent.

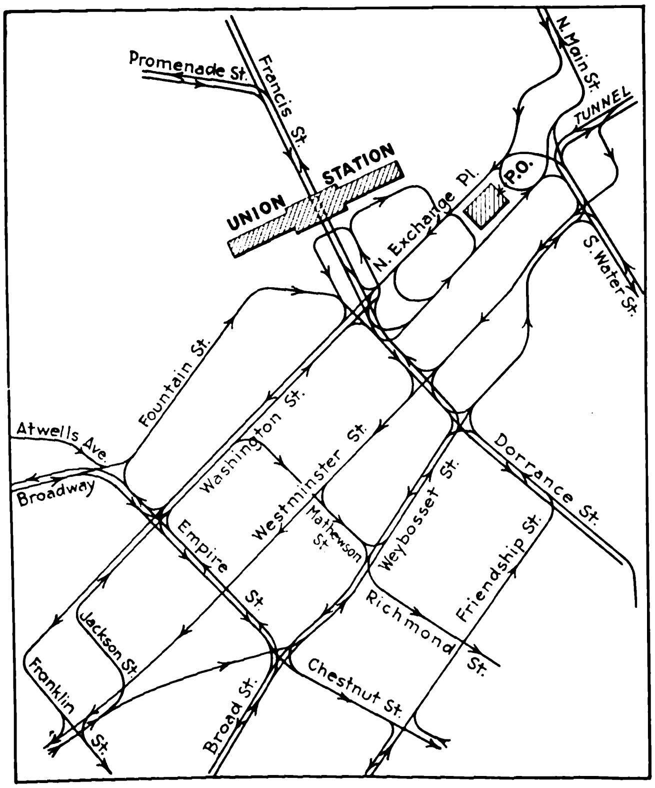
During the severe snowstorms encountered in the winter of 1920, it was necessary for the railway temporarily to split operation on some of the through routes. The resulting improvement in service was so marked that many of its patrons wrote to the company at that time suggesting that the change be made permanent. After careful consideration of all sides of the question and several conferences with municipal authorities, the company decided that loop operation should be substituted for through operation.

Three principal objects were sought. In the first place it was thought that by eliminating the long, slow


Promenade St.
Francis St.
Union Station
Loop 8 23 Cars
P.O.
Tunnel
Loops 1 & 2 98 Cars
Loop 7 59 Cars
Fountain St.
Loop 3 115 Cars
Washington St.
Loop 4 45 Cars
Westminster St.
Atwells Ave.
Broadway
Empire St.
Loop 5 52 Cars
Weybosset St.
Dorrance St.
Loop 6 51 Cars
Richmond St.
Jackson St.
Franklin St.
Chestnut St.

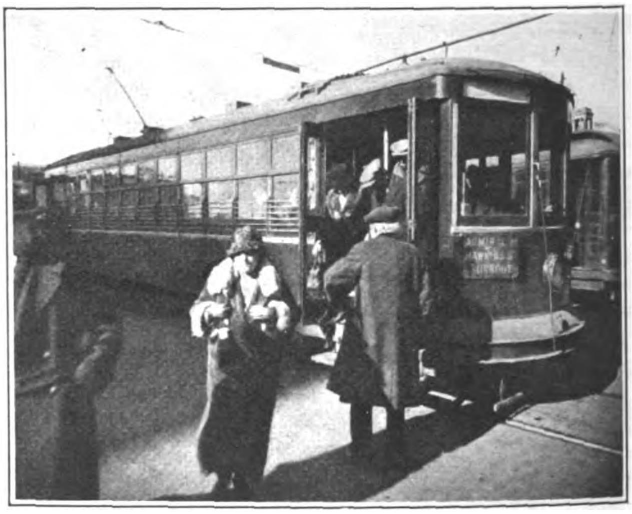
New Routing of Cars Through the Center of Providence Under the Loop System. All Lines Reach Dorrance Street Within a Short Distance of One Another

crawl through congested traffic in the downtown district it would be possible to give more satisfactory service to the majority of the passengers on each of the individual lines. In the second place, it was hoped to eliminate much waste mileage that was being run because carhouses were located near the outer ends of certain routes. To take care of the afternoon rush hour it was necessary to send a large number of cars out at an early hour. These operated to the center of the city practically empty, and on the return trip, after having done their work, operated empty from the center out to the carhouse. Such wasteful operation was a feature of nearly all of the crosstown lines. In the third place the railway wished to install a system of pay-enter-inbound and pay-leave-outbound fare collection. This was impossible with the through routing, but could be arranged easily under the loop plan.


Promenade St.
Francis St.
N. Main St.
Tunnel
Union Station
N. Exchange Pl.
P.O.
S. Water St.
Fountain St.
Atwells Ave.
Broadway
Washington St.
Westminster St.
Dorrance St.
Empire St.
Mathewson St.
Weybosset St.
Friendship St.
Richmond St.
Jackson St.
Franklin St.
Broad St.
Chestnut St.

Former Routing of Cars Through the Center of Providence. Note the Variety of Turning Movements Along Dorrance Street

The city officials approved the proposed change in car routes, and as an additional step to reduce congestion they agreed to regulate automobile parking more strictly. For a week prior to making the change the company published half-page advertisements in all the daily newspapers explaining the reasons why the change was being made and the benefits which it was hoped would result therefrom. Pamphlets were distributed by conductors on the cars explaining in detail the modifications in routes, the new schedules, etc. Special telephone service was given so that it was necessary only to call the company's number and ask for "Traffic Change." This established communication with an official of the railway who could give any needed information. Beginning on the day that the change became effective several starters in uniform were stationed at central locations to help perplexed patrons.



Passengers Board and Alight in the Congested District at Both Ends of the Car Under the Pay-Enter-Inbound and Pay-Leave-Outbound System of Fare Collection

The general nature of the change is shown by the accompanying drawings of car movements in the center of the city. An outstanding feature of the old routing was the excessive number of turns into and out of Dorrance Street. At the intersection of Dorrance and Weybosset Streets in the rush hour 26 cars made a left-hand turn against 72 cars which continued straight across. At Westminster Street 104 cars southbound had to cross 116 eastbound and westbound cars. In front of the City Hall 41 cars made a left-hand turn across 40 westbound cars. On Washington Street 86 cars had to cross 139. Another bad feature of the old plan was the congestion on the north end of Weybosset Street, where many lines operated along a narrow, crooked thoroughfare.

All this has been changed under the new routing. Cars coming into Providence from the north turn back on Loops 1 and 7. Cars coming from the west pass under the Union Station and operate over loops via the north side of Exchange Place, returning via the south side of that street, thence into Francis Street. At first these cars took a crossover on Francis Street, but because no sheltered waiting station was available there for passengers, and because a somewhat dangerous condition was created by their walking across Exchange Place, this plan was changed in favor of the present method of operation. Approaching the city from the south and southwest cars use Loops 3, 4 and 5. Loop 6 is used by cars coming from the east. There are now forty-one routes in all as compared with the thirty-five formerly operated. The density of traffic on the different loops in the rush hour is shown in the table:

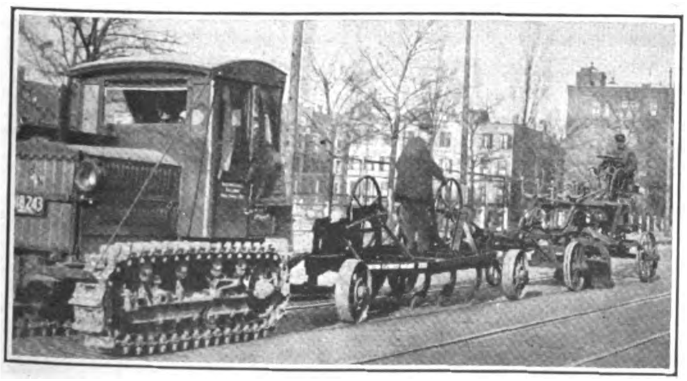
Loop 1	62 cars	Loop 5	52 cars
Loop 2	36 cars	Loop 6	51 cars
Loop 3	115 cars	Loop 7	59 cars
Loop 4	45 cars	Loop 8	23 cars

Considering the wide scope of the changes made very few complaints have been received. The majority of railway patrons have undoubtedly benefited by the new arrangement and are pleased. Some time after the loop system went into effect a central belt line was established, in order to connect up the different lines. This operated on a 7½-min. headway from the Union Station via Dorrance, Westminster, Mathewson, Weybosset, Market, Canal Streets and the north side of Exchange Place. Free transfers were issued and accepted between this belt line and other lines in the central district. The average number of passengers carried per trip was one. Many trips carried no passengers at all and after a two months' trial this belt line was abandoned. The light riding on the belt line proved that very few people have been inconvenienced by the discontinuance of the crosstown lines.

Practically all lines now enter Dorrance Street and come to within a short distance of each other. Passengers bound to or from the central business district can make the trip without change, and the comparatively small number desiring to go from an outlying district on one side of the city to an outlying district on the other side can do so by changing cars in the center and walking a short distance to reach the other line.

Tractor-Drawn Plow Cuts High Ice

ANOTHER addition to its snow-fighting equipment made during the past winter by the Boston Elevated Railway was that to remove the crown of high ice which sometimes forms between the rails. This is a Killifer ice breaker drawn by a tractor.



The Projecting Teeth Break Up High Ice Between the Rails

Following the ice breaker is an ordinary road scraper to clear the broken ice away from between the rails. The accompanying illustration shows clearly how the equipment is set for service.

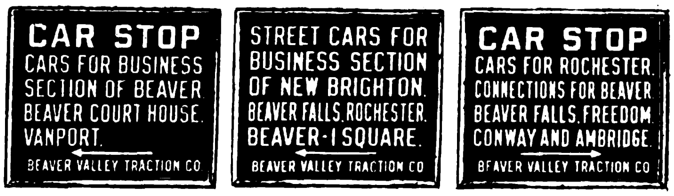
Signs Tell Strangers How to Reach Their Destinations by Railway

By W. H. Boyce

Commercial Manager Pittsburgh Railways[*]

IN THESE days of competition, modern business methods must be applied. Try to induce people to ride. Don't be ashamed of the product you have to sell, unless it's that kind of a product. Even then, a bold front would help get you more than the "just can't help it" riders.

Did you ever step into another man's town where the taxicabs are always plentiful, the chauffeurs of which are more than willing to separate you from 50 cents or a dollar to take you to a location that could be just as easily and almost as quickly reached by a street car that two or three minutes later passes the place where you are standing?



Such Signs Are a Real Help to Strangers

Did you, preferring to patronize the street railway company, and wishing to save the difference in fare and not wanting to appear as a stranger in a strange land, stand on the station sidewalk, trying to appear to be looking directly ahead and all unconcerned in an attempt to make "the folks" think that you felt right at home, and did you at the same time roll eyes right, left, up, down, and all around in an attempt to bring within your range of vision some indicator which would show you when, where, how and to what points the street cars operated?

Well, others have been in the same fix. A few of them may slip around the corner of the station, out of sight of the taxicab drivers, and make inquiry of some hanger-on regarding street car operation. The majority of them, wishing to be thought of as world and town wise, hard-boiled travelers, take to the taxi, and of course the railway company loses a passenger.

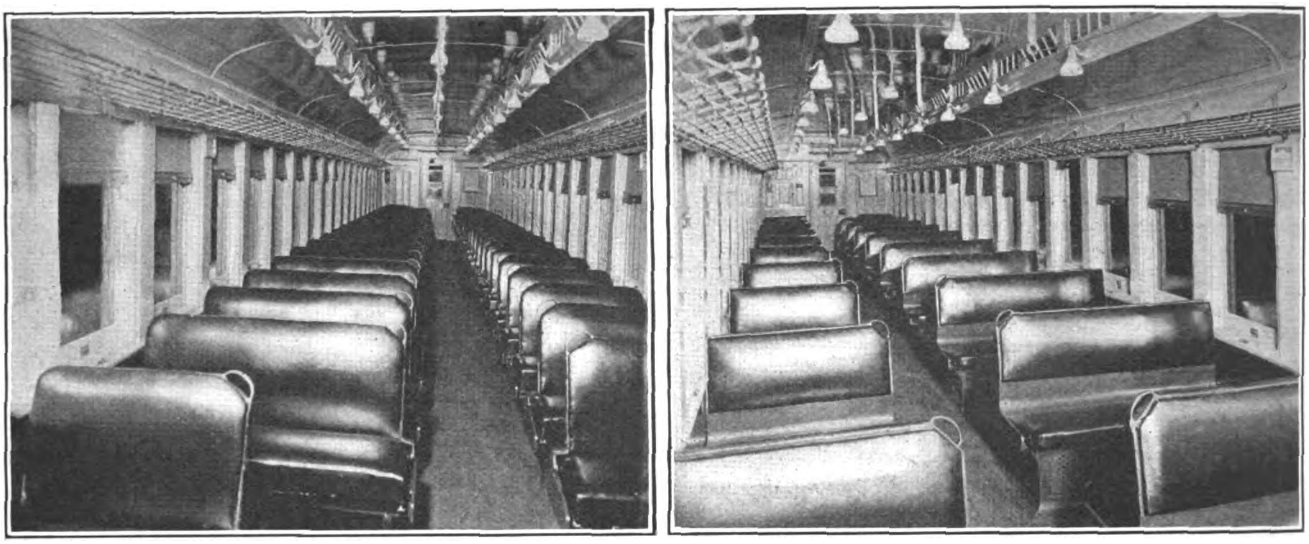
An item of their merchandising of transportation campaign to help swell their receipts, as well as to guide the stranger in their midst, is the installation of a number of blue and white enameled signs by the Beaver Valley Traction Company and the Pittsburgh & Beaver Street Railway. These signs, 23½ in. x 27½ in., and 23½ in. x 11½ in., are located at various railway stations and at the nearest points on car lines adjacent thereto, as well as at points of heavy traffic within the business section of the larger towns.

Some of the signs in use are shown in the accompanying illustration. Those headed "Car Stop" are located at car stops, and the others serve as guides to persons leaving the train at the station, which is a short distance from the car track.

In addition to the signs already mentioned, smaller blue and white enameled signs, 16 in. x 8 in., reading "To Street Cars," with arrow indicating the direction, are located at various points, such as the high school football fields, and in front of hotels or other points where strangers are apt to be in need of directing.

---

[*] At the time this article was written Mr. Boyce was general manager Beaver Valley Traction Company.



Two Experimental Arrangements of Seats to Increase the Capacity. *Left*—**Back-to-Back Stationary Seats. Right—Reversible Seats**

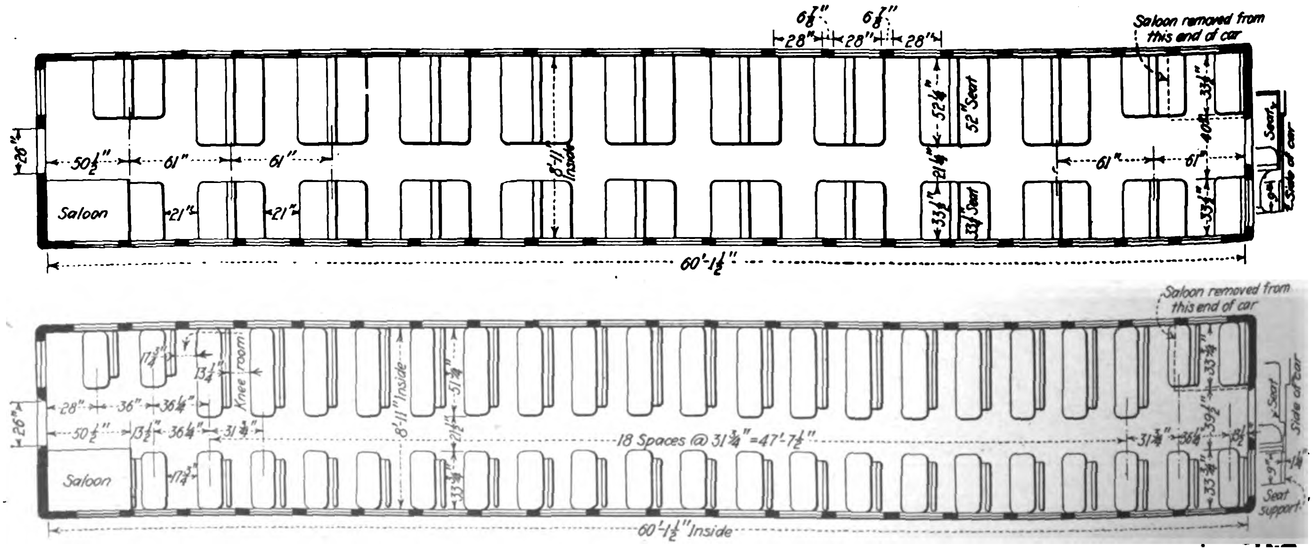
New Seating Arrangement to Increase Capacity

Seats for Three on One Side and Two on the Other Side Increase Capacity of Multiple-Unit Coaches of New Haven Railroad 38 per Cent

DURING the last three years the number of trains into and out of the Grand Central Terminal, New York, during commuter hours has approached the station capacity. Yet each day an increase of 3,000 passengers over that of the corresponding day of the preceding year has had to be handled, which has resulted in the New York, New Haven & Hartford seeking a way to increase the seating capacity of its cars, as the number of trains and the number of cars per train has about reached the limit.

Two experimental seating arrangements have been installed in two multiple-unit cars which have been re-equipped for this experiment. Additional seating accommodations have been provided by a closer spacing of seats than formerly and the use of a three-passenger seat on one side of the aisle and a two-passenger seat on the other. A different seating arrangement has been installed in each car, but each has the three-passenger seat, one in the form of a reversible seat and the other a stationary back to back seat. These two cars are a part of the equipment used in suburban service and have been rearranged at a cost of $2,000 each. The recent installation in service was accompanied by installation of signs in suburban cars setting forth the reason for the change and inviting the patrons to express their preference between the two types of seats and seating arrangement.

The converted car is 60 ft. long inside and 8 ft. 11 in. wide between the inside linings. In the case of the reversible seat car the seat spacing has been reduced from the previous standard of 34⅞ in. to 31¾ in., and a Pantasote covered low back seat has replaced the high back plush seat. This gives a seating capacity of 104, or an increase of 38 per cent over the old arrangement that accommodated 75. The new seats are without arms, the wide seat measuring 51¾ in. and the narrow


6⅞"
6⅞"
28"
28"
28"
Saloon removed from this end of car
52¼"
52" Seat
21¼"
33⅛"
33" Seat
33⅛"
40"
Seat
Side of car
9"
26"
50½"
61"
61"
61"
61"
8'-11" Inside
Saloon
21"
21"
60'-1½"
Saloon removed from this end of car
17¾"
13¼"
Knee room
28"
36"
36¼"
50½"
13½"
36¼"
31¾"
8'-11" Inside
51¾"
21½"
33¾"
18 Spaces @ 31¾"=47'-7½"
31¾"
36¼"
39½"
33¾"
33¾"
13½"
Seat
Side of car
9"
1¼"
Seat support
Saloon
17¾"
60'-1½" Inside

Rearrangement of Multiple-Unit Coaches Used in Suburban Service of the New Haven Railroad to Increase Seating Capacity
Above—Stationary seats back to back were tried in this car. Below—Another car was equipped with this arrangement of reversible seats

seat 33¾ in., leaving an aisle of 21½ in. This width of aisle allows free passage of passengers in both directions because of the low backs which do not extend the full width of the seats. The seat construction is the same as is usually found in rapid transit cars, with full spring cushion and back and a handle located at the aisle end of each back.

In the other car the backs of the stationary seats, covered also with Pantasote, have been spaced 61 in. apart, allowing 21 in. of knee room between facing seats. This arrangement of seats gives a capacity of 108, or an increase of 44 per cent over the former seating arrangement.

The three-passenger seats have not been placed at the extreme ends of the cars. The last two seats are of the two-passenger type, allowing a wider aisle at the body entrance. No change has been made in the platform or vestibule doors. One toilet has been removed from each car, allowing space for seats for four more passengers.

St. Paul Valuation Before Minnesota Commission

Cost to Reproduce the Property Is Submitted by Consulting Engineer for the Company on Six Different Bases of Unit Costs—Going Concern Value Placed at $4,000,000

THE Railroad and Warehouse Commission of Minnesota opened hearings on March 31, 1924, to determine the value of the property of the St. Paul City Railway. Upon the valuation fixed by the commission at this hearing will depend the rate of fare to be in effect in St. Paul. The company now has a 6-cent fare, which is lower than that established in many cities of the size of St. Paul, but the city is endeavoring to reduce this rate. The present case was started in 1921 and after a conference of the valuation engineers for the company and the cities of Minneapolis and St. Paul with the commission it was decided to make valuations of the property on six bases.

At the March 31 hearing, Mr. Drum of A. L. Drum & Company, Chicago, on behalf of the company, submitted to the commission valuations of the property on these six bases, which are itemized by classes of property in the accompanying table.

The St. Paul City Railway operates the entire street railway system located within the corporate limits of the city of St. Paul, Minn., and a line to South St. Paul, consisting of about 8.29 miles of single track outside of the city limits. The inventory and appraisal includes the entire property in the present St. Paul 6-cent fare zone, consisting of the property of the St. Paul City Railway and the property comprising the line on East Seventh Street from Duluth Avenue to city limits of St. Paul and the South St. Paul line extending outside of the city limits of St. Paul. The property consists principally of 176.71 miles of single track; lands; the power distribution system, consisting of overhead trolley, feeder lines, underground conduit and underground wires; car equipment; carhouses; office, shops and miscellaneous buildings; four rotary converter substations, having an aggregate capacity of 20,400 kw., all primary power being furnished by the Minneapolis Street Railway and the St. Anthony Falls Water Power Company; shop machinery; tools; miscellaneous equipment, consisting of office furniture and fixtures.

The valuation of the physical property was made from a complete and detailed field inventory of the property taken as of Jan. 1, 1920, to which have been added the net capital expenditures from then to Jan. 1, 1922, to bring the valuation to the latter date.

The cost to reproduce the physical property now represents the minimum amount of capital that would have been required actually to reproduce the physical property of the company as of Jan. 1, 1922, on the following six different bases of unit costs: (1) Pre-war cost as of Jan. 1, 1920, using average prices for the five-year pre-war period, 1911 to 1915, inclusive; (2) ten-year average cost as of Jan. 1, 1920, using average prices for the ten-year period, 1912 to 1921, inclusive; (3) July 1, 1921, cost as of Jan. 1, 1920, using current prices as of July 1, 1921; (4) present-day cost as of Jan. 1, 1920, using current prices as of April, 1922; (5) Sept. 15, 1923, cost as of Jan. 1, 1920, using current prices as of Sept. 15, 1923; (6) estimated original cost as of Jan. 1, 1920, derived from the books of the company, or estimated, using prices in effect when property was installed or purchased.

The total power supply used by the St. Paul City Railway Company is generated at the steam power station of the Minneapolis Street Railway and at two water power stations operated under a lease from the St. Anthony Falls Water Power Company to the Minneapolis Street Railway, expiring June 1, 1937.

The value of the water power leases to the St. Paul City Railway is based on the saving effected due to the two water power leases, this saving being computed on the basis of the total cost of the electric power pur-

THE COST TO REPRODUCE NEW AND THE ESTIMATED ORIGINAL COST OF THE PHYSICAL PROPERTY OF THE ST. PAUL CITY RAILWAY AND LEASED LINES AS OF JAN. 1, 1922

Division	Pre-War Cost, Average Prices 1911-1915	Ten-Year Average Cost, Average Prices 1912-1921	1921 Cost, Prices Current July 1, 1921	Present-Day Cost, Prices Current April, 1922	Estimated Original Cost	September, 1923, Cost
Land	$994,613	$994,613	$994,613	$994,613	$994,613	$994,613
Track and paving	5,482,794	7,184,175	9,856,108	8,960,410	4,475,782	9,033,012
Bridges, trestles and culverts	114,445	129,284	141,976	138,104	109,633	141,841
Tunnels	400,062	522,167	657,574	651,138	329,679	640,733
Electrical distribution system	1,179,120	1,654,123	1,742,350	1,585,408	1,256,550	1,888,921
Rolling stock	2,818,151	4,390,329	5,838,799	5,257,859	2,599,280	5,932,093
Substation equipment	395,453	527,164	720,114	639,908	456,916	720,322
Shop machinery and shop tools	561,742	782,811	954,754	807,375	564,872	989,141
Buildings and structures	988,416	1,401,241	1,731,750	1,612,750	974,082	1,717,196
Furniture and fixtures	68,530	104,588	140,645	122,622	68,530	148,638
Stores, tools and miscellaneous equipment	578,027	578,027	578,027	578,027	577,795	578,027
Expenditures not apparent in inventory	149,696	149,696	149,695	149,695	89,996	149,696
Engineering and superintendence	686,552	920,910	1,175,320	1,074,896	624,887	1,146,712
Administration, organization and legal expense	671,354	747,138	831,457	817,534	661,628	822,100
Taxes during construction	220,485	312,002	442,835	442,835	220,485	422,143
Interest during construction	1,837,133	2,447,793	3,114,720	2,859,980	1,680,567	3,041,422
Working capital	305,444	305,444	305,444	305,444	305,444	305,444
Cost of financing	872,600	1,157,575	1,468,809	1,349,929	799,536	1,434,602
Grand total	$18,324,617	$24,309,080	$30,844,990	$28,348,527	$16,790,275	$30,126,656

chased under the water power leases and the total cost of manufacture of this if generated at a modern steam power station. The total saving to June 1, 1937, is prorated between the Minneapolis Street Railway, the St. Paul City Railway and the Minneapolis & St. Paul Suburban Railroad on the basis of the total kilowatt-hours used by each. This element of value was included at $782,229.

The presentation of the claim for "going concern value" was made generally on the basis that the St. Paul City Railway had passed through the following stages of development: (1) Construction period; (2) developmental period of construction; (3) period of development into a successful going concern.

Mr. Drum submitted that the fair going concern value of the property was determined to be not less than $4,000,000, based on an estimate of the cost of placing the physical property in successful operation.

The basis recited that, in addition to the cost of the component parts of the bare physical property, the cost of placing the physical property in successful operation, that is, the cost of converting the inert railway plant into a successful operating system, is an element of cost that is encountered in creating a street railway system. In determining the amount of this item of cost the fact was considered that the St. Paul City Railway is in active and successful operation and has passed through the period between the beginning of operation and the time when the business earns not only operating expenses and taxes, but also a return on the investment, so that the cost of bringing the bare physical property into an efficient operating going concern has been encountered and met.

The business of the company has been built up, the service and equipment have been planned and perfected successfully to serve the business, an experienced and successful operating staff has been organized, trained and perfected in its duties, and extensions have been made into unpopulated territory requiring many years of operation before the increase in population (due to the construction of such extensions) can create traffic sufficient to pay the operating expenses and interest on the capital invested in such extensions.

Another element of going concern value submitted was that due to the consolidated operation with the Minneapolis street railway system, which was measured by capitalizing the estimated saving per year to the St. Paul company.

The Readers' Forum

Scheduling Car Leaving Times

PIQUA, OHIO, March 31, 1924.

To the Editors:

Your editorial entitled "Make Your Headways Sell Your Service" in the issue of March 15 has in it so much with which I find myself in thorough agreement that I hesitate to take exception to some other features of it. Let me rather suggest that we expand the ideas of scheduled leaving times and of so-called "freak headways" a little further.

While I agree that freak headways should not be deliberately set up when they reasonably can be avoided, there are some circumstances and conditions that have a very marked bearing on this question. Likewise in the matter of scheduled leaving times of cars on lines operating on a "regular" headway.

Take, for example, three lines each operating on a 10-minute headway from a central terminal using common track for 1½ or 2 miles out to the point of divergence. I believe that as a general rule, if cars on routes A, B and C are spaced 3, 3 and 4 minutes apart over each 10-minute period on the common track much better service is provided than if three cars, bunched, went out over this 1½ or 2 miles every 10 minutes. The advantage of frequent service in the short-haul territory outweighs the possible disadvantage to the patrons of lines B and C whose cars leave the central terminal at 3, 13, 23, etc., and 6, 16, 26, etc., minutes after the hour rather than at 10, 20, 30, etc., minutes after the hour.

On a relatively small system with several lines radiating from a central point and with very little joint track used by cars on different routes, it generally would be desirable for all cars to leave at the same 10, 20 or 30 minutes past the hour, both for ease in remembering the schedule and to facilitate transfers. But peculiar local conditions might modify any general rule.

Take again the case of suburban and interurban service operated from a terminal station like that of the Pacific Electric Railway in Los Angeles on headways of 20, 30 or 60 minutes, with three, four or five-car trains. Concentration of scheduled leaving times serves to limit the station capacity not only as to tracks but also as to waiting room area, gate, passageway and platform space. Much better service is possible by spreading the leaving times of different lines more evenly over the hour. It also would have a tendency to smooth off the power peaks.

The staggered hour plan is applicable not only to the hours for industrial and other labor for the purpose of smoothing off the traffic peaks, but may be applied to scheduling of cars and trains from concentrated terminals.

Referring now to the freak headways there seem to by two features you have raised for consideration: First, headways in excess of 5 minutes or in excess of 10 minutes, which are not exact multiples of 5 minutes, such as 17 minutes or 28 minutes; second, headways that are unbalanced such as 4 and 6, or 3 and 7, even though the average may be exactly 5 minutes.

I would say that the occasion would be very rare that would justify a 28-minute headway rather than a 30-minute headway, particularly if we were dealing with an individual line not complicated with local service. Very often suburban service is supplied by having certain cars (i.e., every second, third, fourth, fifth or sixth car) in city service run through to the suburban terminal. The traffic demand on the city line determines the basic headway for the city service. The suburban service, particularly in off-peak hours, is not determined by traffic which may be very light, but, let us say, has been determined upon as a matter of policy to be on a headway of approximately 15 minutes.

If the city service is on an 8-minute or 7-minute headway, we could probably stretch a point and use a basic 7½-minute city headway and send alternate cars to the suburban terminal on an even 15-minute headway. But if the city line traffic requires a 6-minute headway shall we take alternate cars and give a 12-minute suburban headway, or take every third car and give an 18-minute headway? I know of conditions that would justify the 12 and others that would justify the 18.

If a 6-minute headway is proper for the city line it would be too much like making the tail wag the dog to say that the city line should be cut to 5 minutes in order to make a nice even 15-minute headway to the suburban terminal. And likewise, if a 6-minute headway is required, a 7½-minute headway would be very inadequate and quite unjustifiable merely to make an even 15-minute suburban headway.

Every third car on a 5-minute headway, or every fifth car on a 3-minute, make up an even 15-minute suburban headway, but if city traffic requires a 3½ or 4-minute headway, the resultant suburban headway would be 14 minutes in the first case and either 12 or 16 minutes in the second case. Conditions may justify arranging the headways in cycles of 4, 4, 4 and 3 minutes, every fourth car being a suburban car on an even 15-minute headway. And let me say that I would put the suburban car, which serves the longest stretch of the line, following the 3-minute headway in the 4, 4, 4 and 3 cycle.

The foregoing discussion assumes double-track operation, at least no obstacles due to different headways on single track. But very often the problem is complicated by single track and again general rules must be altered to suit the local conditions.

Much of what has been said relative to suburban cars operated as integral parts of the city service is applicable to city lines with split or multiple terminals, turn-back service, etc. Typical examples may be found on the Milwaukee system and on the Winnipeg lines. Service demands on the main line should generally fix the main line headways rather than the desirability of making the branch line headways multiples of 5 minutes. I have before me a concrete example of the effect of changing a main-line headway from 6 to 5 minutes with resultant branch line headways changed from 12 to 10 minutes.

The change was made for the off-peak hours in the middle of the day and was not based upon traffic checks, which, by the way, showed a 6-minute headway to be adequate, but for some other reason, perhaps to make the branch line headways 10 instead of 12 minutes. The car mileage was increased about 750 car-miles per day with no appreciable increase in revenue. It simply showed that a 6-minute headway served the frequency factor of adequate service on that particular line as well as a 5-minute headway. I believe 750 car-miles per day is too great a price to pay for the difference between a 12- and a 10-minute branch-line headway.

Moreover, the electric railways in this country are operating on rather narrow margins and, speaking generally, are not in a position to waste service for the sake of headways of exactly 10, 15 or 20 minutes. One or two cars on one line for a few hours does not seem to cost much for one day, but the cost of one or two more cars on each line totals a neat little sum in the course of a year. In many cases the additional expense produces no commensurate return.

With reference to combination headways of 7 and 3 minutes I do not believe many schedule departments are laboring under any illusions on this point. While the 3 and 7 combination is rather extreme, a 5 and 7, a 4 and 6, a 3 and 5, a 2 and 3 or some other similar combination may be used, not by mistake or through carelessness, but for a very definite purpose.

The use of combination headways is particularly suited to city lines having turn-back or short-line service where all cars do not go to the end of the line, and where there is from 20 to 30 per cent of the total traffic beyond the turn-back point. If the traffic check taken within the zone of maximum loading shows the need for an average 5-minute headway the through cars would be overloaded and the turn-back cars would fail to carry their share of the load if all cars were spaced exactly 5 minutes apart.

A much better balance of the loads is obtained by the combination headway of 4 and 6 minutes with the short line car following the 6-minute interval and the long line car following the 4-minute interval. It is not advisable to put in too much differential, and in this connection it may be noted that a short-line passenger just missing a short-line car can take the next car which will be a through car. But a through passenger unable to get aboard an overloaded through car or just missing it cannot reach his destination on the next car (which is "turning short") but must wait for the next through car. Therefore the through cars should be favored in the time differential even more than the traffic ratio would indicate.

Another occasion for justifying combination headways is where single cars and two-car trains are used on the line at the same time. If traffic comes to the line at such a rate as to justify a 4-minute service with single cars, or an 8-minute service with two-car trains, the schedule for alternate single and double units should not be an even 6-minute headway. The double units would be underloaded and the single units would be overloaded.

Experience indicates that a space interval in front of a two-car train equal to twice the interval in front of a single unit produces an unbalance in the other direction, at least in city service subject to variations encountered in actual surface operation. In the case cited the combination headway would probably work out on a 5 and 7-minute basis rather than on a 4 and 8-minute basis or on a 6 and 6-minute basis.

Thus, in the tendency toward lack of balance in passenger loads due to difference in length of route or territory served or in the size of the successive passenger carrying units, we find ample justification for combination headways made up of unequal intervals.

I realize that in endeavoring to make some points clear I may have made some general statements open to the same criticism that might apply to the editorial. If so it only proves the point that each property has its own peculiar problems which require separate analysis and individual treatment. This leads me to quote the third paragraph of your editorial in pointing the way:

"Undoubtedly great economies in electric railway operation have been accomplished by the scientific scheduling of cars. Careful study by competent men is required to prepare time-tables so that cars will not pull out too early, stay out too long, waste time in excessive layovers, or bunch in the central district. The time and money employed to make accurate traffic checks are well spent."

JOE R. ONG,
Consulting Transportation Engineer.

Association News & Discussions

Badgers View Utility Business Broadly

Responsibilities of Utility Management, Speakers' Bureau Activity and Training of Women Employees for Publicity Work Are Considered—Railway Section Holds Lively Discussion on Many Operating Subjects

AT THE meeting of the Wisconsin Public Utilities Association, held at the Hotel Pfister, Milwaukee, on April 17 and 18, a broad conception of the utility business was voiced by the speakers at the general sessions. In the railway sectional meeting, held during the afternoons of the two-day session, papers dealing with detailed technical operating and maintenance problems were given a spirited and enthusiastic discussion. Although the railway men in attendance did not quite accept the invitation of Chairman B. W. Arnold to remove their coats if necessary, the frank and free discussion accorded most of the papers added greatly to the value of these sessions.

The broadminded thinking of the general sessions reached its climax in an address delivered on Friday morning by John F. Gilchrist, vice-president Commonwealth Edison Company, Chicago, who took the responsibilities of utility management as his subject. He said that the management of the present-day public utility property is vested with responsibility to many interests, and unless each is fully considered in the administration of the company's affairs, the utility does not develop its service in the fullest sense of the term. The modern utility management carries a direct responsibilty to the people of the district served, to the customers of the utility, to the employees of the company, to commercial and industrial organizations in the community and to the stockholders of the company.

If the utility discharges its obligations to the first four interests in accordance with the fullest conception of real public service, Mr. Gilchrist contended, the interests of the stockholders will be automatically safeguarded. This, he said, is true because failure to earn a fair return to the stockholders immediately reacts to curtail the service which the company can render because such failure limits the ability to meet the needs of a growing community.

Mr. Gilchrist went further in his analysis and said that each management owes an obligation to its brothers in the industry and should take part fully in any activity to further the interests of the industry as a whole.

Since the utility industry can only function properly and efficiently as a monopoly, Mr. Gilchrist said that this in itself imposed several extremely important obligations and responsibilities. The first of these is the responsibility to maintain both continuity and adequacy of service. Then there is the responsibility of providing new capital to take care of needed extensions as the community develops. Customer ownership of the company's securities has proved to be one means of meeting this later requirement.

A further responsibility is that of assuming a proper place as a leader in the community. Another is the development of young men as future utility leaders and managers. The rapid development of industry in general and the increasing complexity of the problems involved raise a serious question, Mr. Gilchrist said, of the possibility of developing men rapidly enough to keep pace with the continually increasing requirements.

SATISFACTORY PROGRESS MADE

In his opening address at the general session, President Harold L. Geisse attributed the success of the association to the co-operation of its individual members and also paid a tribute to the assistance rendered by the associate manufacturer members. The activities of the association and its committee on public utility information has produced a noteworthy improvement in public understanding of the utility problems in Wisconsin and surrounding territory. He reported the organization of a speakers' bureau to supplement with the spoken word the work carried on by the committee on public utility information through the newspapers.

WOMEN EMPLOYEES TO HELP

Another step in the publicity work of the association was marked, Mr. Geisse said, by the organization of a women's public information committee in conformity with the work started by the National Electric Light Association. In their various capacities, he said, women are important contact points with the public and their education and training may be expected to aid materially in presenting authoritative facts to the general public regarding the utility business.

Miss E. M. Westenhaven, chairman of the women's public information committee, outlined the progress already made in organizing this women's work. Of the 575 women employed in utility work, exclusive of telephone companies, in Wisconsin, 528 have been included in the educational work under way. Speaking of the qualifications of women employees, she cited the success with which they have engaged in the sale of utility securities to the public as an illustration of their qualifications for assisting.

W. S. Vivian, Middle West Utilities Company, delivered an address on the subject of "Service." He drew a distinction between service and facilities, pointing out that the latter includes the mechanical facilities of the company only, whereas the former also includes the personnel and the personal contact.

General principles which have governed the organization of safety campaigns in various cities were outlined by J. W. Harte, Elliott Service Company of New York.

HIGH INTEREST IN RAILWAY SECTION MEETINGS

At the opening of the railway section meeting Thursday afternoon, Chairman B. W. Arnold, Chicago, North Shore & Milwaukee Railroad, voiced approval of the combined meetings with other branches of the utility business. He thanked the membership for its co-operation during the two-year period of his chairmanship and stated that the individual members profited from meetings of this kind in direct proportion to the enthusiasm and energy with which they entered the activities and participated in the discussions.

A paper on substitute ties was read by J. C. Jameson, vice-president Dayton Mechanical Tie Company. He said that their use, although now stimulated by the difficulty of securing good grade wood ties and by the constant upward trend of wood tie prices, would likely in a few years be forced upon railways by the government in its effort to conserve the forests. He advocated some means of preventing the transmission of the shock and vibration of rolling stock directly to the concrete in which the ties are imbedded. Concrete, as a track foundation in paved streets, was held by him to be the best construction. Crushed rock or gravel ballast is practical only in open track which permits of periodical tamping. When sealed over by street paving, some shifting of ballast must occur.

In the discussion of Mr. Jameson's paper, A. A. Oldfield, Oshkosh, stated that the high price of substitute ties prevented their wider use. He also said that it sometimes became necessary to use stone ballast when making repairs under track carrying traffic. In regard to noise he reported no more noise with substitute tie construction than is obtained on wood ties, when the traffic consists of light-weight cars.

Dudley Montgomery, Madison, said that his property had tried the use of steel ties and had found considerable difficulty in bringing the track to line and surface in hot weather. He also said that steel ties had been found more noisy than wood ties and believed that the type of pavement was a considerable factor in the selection of the type of tie to be used. He questioned the value of a substitute tie in monolithic construction where the track is imbedded in concrete. He felt that in this form of construction the rail is carried and imbedded in the concrete, and described the use of old wood ties in some recently constructed track in Madison, utilizing wire reinforcing between rails. He stated that this track was expected to give good results for the operation of light-weight cars.

C. E. Warwick stated that no particular difficulty had been encountered in Green Bay in properly lining up the track when using substitute ties. He said that in hot weather the practice of leaving some of the joints open and completing the welding operation at night or in the evening under lower temperatures enabled proper alignment to be made. Mr. Oldfield said that by using 60-ft. rail lengths in Oshkosh, it was possible to weld up approximately five lengths of rail in advance. By keeping the aligning gang at work directly ahead of the concrete machine, no particular difficulty had been experienced.

N. C. Rasmussen, Wausau, reported some difficulty in holding track to line and surface in hot weather but said that his property was able to obtain satisfactory results by avoiding welding too far in advance of the concreting gang.

CHILLED IRON WHEELS DISCUSSED

The manufacture, test and maintenance of chilled iron wheels to meet service conditions was the subject of a paper read by Francis J. Fox, Griffin Wheel Company. Mr. Fox listed the essential requirements of a car wheel as follows: (1) Sufficient hardness of the wearing surface to carry concentrated loads without excessive deformation over irregular tracks at high speeds; (2) maximum service on the wearing surface per unit of metal worn away; (3) maximum coefficient of friction between tread and brakeshoe; (4) tread surface should allow maximum durability of shoe; (5) wheel should produce minimum wear on rail.

By means of enlarged charts he described the method of chilling the tread and a portion of the flange of chilled iron wheels, and described the character of the resulting metal. This he said consisted of combinations of carbon and manganese with the iron. At the tread, the carbon is retained in combined form by the sudden chilling and the resulting metal at this point is very hard, containing 3.5 per cent of combined carbon. Mr. Fox then described the condition of the metal at various points in the wheel from the tread to the hub, stating that the combined carbon gradually decreases and the amount of graphite increases, giving the desired physical characteristics for the various parts of the wheel. At a point near the hub, he said, a sample taken from a wheel would show 96.5 per cent iron and 3.5 per cent graphite and would have the characteristics of soft steel.

Mr. Fox further described the methods used in the manufacture, testing and inspection of chilled iron wheels. He also pointed out that the service results obtained depend to a considerable extent upon the service conditions on each property, and stated that machining, mounting and maintenance practice have an important bearing on the total life of the wheel.

CAST AND ROLLED WHEELS COMPARED

Many of the members present engaged in a general discussion of Mr. Fox's paper, which, in general, resolved itself into a comparison of results obtained with rolled-steel and chilled-iron wheels. A considerable part of the discussion related to the subject of flat spots on chilled-iron wheels, resulting from skidding, in comparison with those on rolled-steel wheels. Mr. Montgomery attributed a considerable part of the difficulty with flat spots on chilled-iron wheels to the action of sand when used on slippery rails. He stated that the chilled-iron wheels tend to slide on striking the sand, whereas the steel wheel continues to roll. He reported the results of the practice followed in Madison for a time of washing greasy rail with a sprinkler instead of using sand. Under this condition the difficulty with flat spots on chilled wheels was largely eliminated. But his road was required to go back to the use of sand as a result of a ruling by the Railroad Commission.

In reply to a question, Mr. Fox discussed the variations in the thickness of the chill on the tread of chilled-iron wheels and stated that in the manufacturing process it was possible to control this thickness within comparatively close limits.

AIR BRAKE DEVELOPMENTS

A. B. Wood, Westinghouse Air Brake Company, presented an illustrated paper describing the development of air brakes for light-weight cars. The importance of a proper understanding of the function of the air brake on the part of those who operate, supervise and maintain the cars was emphasized. In the proper selection of brake equipment, in supervising and insisting on proper instruction of operators and maintenance men, and in adopting standardized equipment on the various cars of a property, those in executive charge, Mr. Wood said, can do much to further safe and economical practices.

Mr. Wood pointed out the remedy for several recently detected causes of difficulty with safety control equipments. Among other things, the use of a choke fitting in a union close to the air whistle on interurban cars was recommended as a means of overcoming the difficulty from emergency action of the brake when the whistle is blown.

In answer to questions, Mr. Wood also discussed the problem of freeze-ups in air-brake lines and said, as a matter of design, it is almost impossible entirely to avoid this trouble. He also described the construction and operation of an anti-freezing device known as the Air Rectifier, which injects small quantities of alcohol into the system and which was reported by several of those present to have eliminated difficulty from freeze-ups.

The latest developments in automotive brakes were also described and illustrated by lantern slides. This included a description of the rotary inlet valve type of compressor which has been developed for this brake equipment.

CLAIMS WORK DISCUSSED

On Friday afternoon W. T. Bie of Green Bay read a paper showing how the Wisconsin Public Service Corporation has collected more money during the past year than had been paid out in the settlement of claims. The paper will be abstracted in a forthcoming issue. It was discussed by Mr. McQuade of the Chicago, North Shore & Milwaukee Railroad, C. L. Hedges of LaCrosse and N. C. Rasmussen of Wausau. Mr. McQuade said that in a large city it was much more difficult to make the kind of a record cited by Mr. Bie. The North Shore Line, he said, felt that it was accomplishing good results when it held disbursements for claims within 2 per cent of the gross income. The latest figures obtained showed this figure to be approximately 1.6 per cent. He attributed the difference in the conditions of the large city and the small community to the greater difficulty of making and maintaining contact with the residents along the line and with the people of the town who make up juries. In addition he said that the ambulance chaser is always present in the larger city. He advocated the careful and continuous upbuilding of favorable public sentiment, founded on efficient service, as the best method of obtaining permanently improved conditions.

Mr. Rasmussen said that the practice in Wausau was to settle claims whenever possible and avoid lawsuits. Careful training of employees, and cooperation by all operating departments for the prevention of accidents, were held to be the most successful methods of holding the costs of claims to a minimum.

Commissioner A. L. McDonald, in a paper abstracted elsewhere in this issue, held that proper treatment of employees is necessary if they in turn are to be expected to make the proper kind of contact with the public. C. R. Mahan, Chicago, North Shore & Milwaukee Railroad, described several accounting practices of that road in a paper which is also abstracted elsewhere, and Dudley Montgomery of Madison presented a paper giving the result of a study of the growth of automobile and street car traffic with increases in population. From the results of his studies, which are given on another page, Mr. Montgomery expressed an optimistic viewpoint of the future of the industry. In his opinion, there has been no time during the past twenty years when the outlook for the electric railways was as bright as at present. He said that although automotive vehicles offered a type of de luxe service which appealed to certain classes of people, the possibilities of running special service with street cars for certain classes of patrons at increased fares had by no means received the consideration which it merited, and although a railway might be criticised for catering to a preferred class of passengers, such service was comparable with the operation of certain classes of bus service, and warranted careful consideration by railway operators.

ELECTION OF OFFICERS

Acting on the report of a nominating committee, G. C. Neff, Wisconsin Power & Light Company, was elected president of the association; L. L. Tesslier, DePere Light & Power Company, was made vice-president, and H. A. Smith, Southern Counties Power Company, was elected treasurer. In the railways section, Dudley Montgomery, vice-president Madison Railways, was elected chairman, and N. C. Rasmussen, superintendent railway department, Wisconsin Valley Electric Company, Wausau, was made vice-chairman.

◆

The Commission's View of Platform Men*

Trainmen Cannot Make Up for Defects in Service for Which the Management Is Responsible—They Can Win Public Approval by Their Services Beyond Those Forming an Essential Part of the Job—They Should Never Be Censured in Public

By ANDREW L. MCDONALD
Member Wisconsin Railroad Commission

THE Railroad Commission receives many forms of criticism from the car-riding public. Sometimes such criticism or complaint is the result of long-standing alleged inefficiency in service. Frequently it comes from people who spontaneously give vent to their attitude and feeling toward real or imagined disregard of the rights of the car-riding public. The motormen and conductors have quite as much to do with the relations between the public and the company as the board of directors or the manager. They are frequently made the target of complaint and possibly abuse for acts and conditions for which they are not at all personally responsible, but which acts reflect inefficiency or inattention of their superiors. Because of their intimate contact with the public, they have to be men of quick action and thought and should be imbued with absolute loyalty to the employing company. They must be, in the very nature of their employment, much more courteous and considerate than are the people who patronize the cars.

From personal observation as a mere patron of street railway and interurban service, as well as from my experience as a commissioner, motormen and conductors do not generally entertain a narrow and provincial view of the scope and character of their duties. They are not only required to load and unload passengers and run the cars so as to avoid danger to pedestrians and vehicles, but in general must be a kind of geographical encyclopedia and a source of wide information to the public. They are constantly bombarded with all kinds of questions, many of them wholly unrelated to the immediate service in which they are engaged. The employees who are building up a mutually helpful relationship between the riders and the company are those who meet these demands, as well as the technical duties they perform, with unfailing courtesy and sympathy.

The commission, of course, can only insist on such operation as will effectively care for the comfort, the safety and efficient transportation of passengers. It is self-evident that the motorman and conductor cannot make up for defects in equipment or service, for which superintendents and managers are primarily responsible.

The prerequisite importance of amicable and friendly relations between the company and the traveling public is constantly being more fully recognized by the transportation companies. It is not only what is done by employees close to the public that counts, but it is also the manner of doing things that is of vital importance. From my observation the present tendencies of street railway and interurban operation are toward the exercise of a very general spirit of helpfulness and care toward the patrons of the service. In fact, one frequently wonders at the extreme patience which these men exercise. There are, of course, exceptions to this general practice. There is an occasional grouch who does not appreciate or realize the value of courtesy and sympathetic helpfulness. Operators with such a narrow view will not answer the numerous questions that seem nonsensical and often without point. To the patron making such queries, however, the answer may be of vital importance. Even when unable to answer a question, the employees' manner may either give offense or may be such as to retain the friendliness and respect of a passenger.

COMMISSION OBSERVERS GIVE EXAMPLES, GOOD AND BAD

In this connection general criticisms and deductions perhaps are of much less value than concrete illustrations. Pursuant to this thought I called together those of our staff whose duty it is to check up men in the operating branch of the service in question and asked them to tell me some of the things that had come to their attention within the last year in the different cities in the state, and a recital of some of these may be helpful to those charged with the immediate duties of operating the railway properties.

One of them said that recently during rainy weather a car in a certain city was very much crowded and those standing in the rear might easily have moved forward so as to permit several to board the car who were standing out in the rain. The conductor requested the passengers to move forward but was met by a noisy protest from a prominent man who shouted defiance to the effect that he did not propose to "crowd" forward for any one. This patron was thinking of himself and selfishly had forgotten all about the people standing out in the rain. The conductor bore the loud criticism with patience rather than to retort as most people would be inclined to do. Unquestionably he gained the approval and respect of all fair-minded and right-thinking persons in the car.

It was pointed out by the observer who reported this incident, and I feel deserves repetition here, that in this case the conductor used the term "crowd up forward, please." The word "crowd" is what annoyed the irate gentleman spoken of, and it would perhaps have been better to have used the word "move" forward, please, or "step" forward, please. The word "crowd" did not appeal to that observer as the proper term to use under such circumstances.

Of course, it is impossible for street car companies to expect their employees working for moderate salaries to be perfect Chesterfields in courtesy and manner. I am reminded of a story told of a newly appointed railway manager who was riding one of his own cars to observe the performance of the conductor and motorman. The specific conductor called out the names of the streets in such manner that it was impossible to detect the names by which such streets were christened. After some period of observation on the part of the manager he approached the conductor and chided him for his bungling and inefficient manner in attempting to call the names of the streets. The conductor asked him what business of his it was how he called the streets. With great dignity the manager declared his official capacity and advised the conductor to be more musical and accurate in his future street calling. To this the conductor replied with some heat: "What do you expect of a poor dub getting $75 a month in calling street names—grand opera?"

Many illustrations could be given to show that an unusual degree of judgment is required by street car operators. Quick thinking is sometimes necessary to avoid serious accidents. Another observer stated that recently an automobile was parked at the curb of a narrow street in a certain city. As a street car was approaching at the average speed another automobile was being driven in the same direction just in front of the car, but not on the track. The driver, in order to pass the standing automobile, suddenly and without warning turned upon the tracks immediately in front of the rapidly moving car. The motorman reversed the power and thus avoided what would otherwise have been a very serious accident, with possible loss of life. In this case no blame could have been attached had the collision occurred, but the motorman, through his training in alertness and quick wit, did what was expected of him. He saved the driver of the automobile from the results of his own folly.

Another observer reported recently seeing a conductor get off his car, lift on board a small child, then get off the car again and assist a crippled man to the car and help him to a seat. He later managed to find a seat in a very crowded car for a lady carrying a small child. Perhaps these acts might be interpreted as beyond the conductor's duties but they represent what the public receives in the way of service, purely from the humanitarian impulse which no doubt prompted the conductor in these instances. The public was better served because these acts saved time and allowed the car to proceed more quickly and to reach its destination sooner.

---

*Abstract of paper presented before Wisconsin Utilities Association in Milwaukee, April 17 and 18, 1924.

Many other incidents of like nature might be cited. Those given are a fair sample of the courtesy extended to both deserving and undeserving patrons of street and interurban cars every day.

Supervisors and other operating men have their part in the scheme of public service, and they too will often be called upon to exercise judgment and discretion, which can hardly be said strictly to be included in their duties. In dealing with the men who are operating or maintaining the cars they should not fail to realize that these men are in a position often most trying and nerve-racking.

To illustrate, a short time ago a motorman was seen driving a car along one of the principal streets of a certain city when a little child suddenly darted squarely down the track in front of the car. Quick action brought the car to a stop within 2 ft. of the child. Do you think the motorman's nerves were such that he could at that time have endured any kind of criticism from a superior?

The same observer recently noticed a superintendent standing at a timing point in a certain city when a car approached with its signs improperly set, the two destination signs being in conflict. A bystander who was talking to the superintendent called attention to this. The superintendent stepped into the car and severely reprimanded the conductor in front of a carload of passengers. In the interest of service to the public and in common justice to the employee, this is one mistake on the part of supervising officers that the commission cannot condemn too strongly, and I might add too that it is not so very unusual. While it is true this conductor had made a mistake, and also true that his attention should have been called to it, it could have and should have been done simply by calling his attntion to it at that time and later, if it was deemed necessary, talking to him about it at the barn.

To you supervising officers I would say: Don't forget that your employees are just as human as you are, and sometimes perhaps just a little more so, and don't publicly criticise and censure them and then expect them to deal politely and civilly with the public. Don't forget you are their superior officers and that such criticism from you, especially if unmerited and unjust, irritates and angers them even though they are not in position to express their feelings to you. It is just natural that for some time after such public rebuke has been made it will be pretty hard for that particular conductor or motorman to deal civilly and courteously with the public. Don't forget that this conductor or motorman is your representative with the public and that his attitude and treatment of your patrons either adds to or takes away from the patronage of your company.

RULES AT TIME OF ACCIDENT MUST BE FOLLOWED WITH JUDGMENT

Another little thing has come to our attention. There is a rule in force by practically all companies forbidding employees to give any information to the public in case of an accident. The rule may be well meant, but unless carried out with judgment, its workings may lead to absurdities.

To illustrate, some time ago a slight accident occurred in a certain city shortly after noon when many were going home to lunch. The car was disabled and could not be moved for a long time, a fact known by the car crew. Questions asked by passengers brought no replies from the trainmen, and after waiting for a long time many were compelled to go back to their work without being able to get home for lunch.

Within two or three blocks was another car line that would have delivered these people very near their desired destination. What harm could have resulted if the operators had been permitted to advise the passengers of the facts, which could not possibly have had any bearing on any damage claim that might later be made against the company? The men in charge of that car, or any other car, if properly instructed, can be trusted to exercise reasonable judgment in such cases, and a friendly feeling toward the company is sure to be engendered when people know that their interests are receiving as much consideration as the company's interest in a damage claim.

In conclusion, from my acquaintance with the average railroad man, I would say this: Make all possible effort to have your men properly instructed in their duties, pay them a wage that will keep poverty and want out of their thoughts, treat them as you would be treated yourself if your positions were reversed, and you will find they will respond and that such treatment will bring a splendid return in the way of public interest in your railroad and patronage of it.

Accounting Practice on the North Shore Line*

By C. R. Mahan
Auditor Chicago, North Shore & Milwaukee Railroad, Highwood, Ill.

WE HAVE in practice three methods of accounting that differ somewhat from those in general use on other properties: First, cost department accounting for the engineers; second, centralized merchandise dispatch accounting; third, accounting for tickets issued by cash register machines.

There never was a time in the history of our industry that called for closer co-operation between the engineers and accountants than the present. Today it is very necessary that the accountants exercise the utmost care in correctly stating the cost of maintenance and also the outlay applicable to investment. The very nature of the work performed by the maintenance of way department is so diversified and so widely spread over the entire system of the carrier that constant and careful attention is required to differentiate between the expenditures properly chargeable to income and those which are chargeable to capital.

Carriers working under a budgetary control system endeavor to regulate their expenditures for upkeep and additions and betterments within the amount specified by the budget. In order that the engineers may successfully carry out their part of the program, it is essential that the accountants furnish them with accurate detail unit costs during the progress of the work. Should the engineers be compelled to wait until the work is completed before they are furnished with unit costs, they would have little chance to correct faulty organization; to detect inefficient labor, or to correct imperfect construction or maintenance methods. With these points in view and with the assistance and co-operation of our chief engineer, we organized a cost department under the supervision of the accounting department.

IN CHARGE OF ENGINEER AUDITOR

This cost department is in charge of an engineer auditor, who has had considerable experience in handling cost work and is thoroughly familiar with the requirements of the engineering department as well as those of the accounting department. The personnel of this department was recruited from the engineering and accounting departments, and by this co-ordination of employees developed a combination of forces that had a concrete understanding of the requirements of each department and resulted in the installation of a system of accounting that by one continuous operation provides the engineers with a sectional unit cost report which shows the description of each account, account number, man-hours, money, unit and unit cost, and also summarizes the final result for the accounting department labor distribution entry.

It is our intention, in the near future, to extend the scope of this department so that it will also furnish all other departments with such unit costs as they may find desirable.

Centralized Merchandise Dispatch Accounting. The centralized system of merchandise dispatch accounting is in charge of the merchandise dispatch station accountant under the supervision of the auditor of merchandise dispatch accounts, who in turn reports to the auditor. The purpose of creating this department, in so far as practical, was to separate the accounting from the physical operation of the station.

---

*Abstract of a paper before the Electric Railway Section, Wisconsin Utilities Association, Milwaukee, Wis., April 17-18, 1924.

The receipt of the original waybills for inbound traffic, the revision thereof, the issuing of merchandise dispatch (expense) bills with their component parts, mailing statements to credit patrons and collections and remittance of all charges, remain part of the agent's duties. The methods used were described in ELECTRIC RAILWAY JOURNAL for Sept. 1, 1923, page 329.

The merchandise dispatch accountant's office abstracts by tabulating machines all outbound and inbound waybills and miscellaneous items, furnishing the station agents with their copy and the traffic department with a copy of forwarded abstracts. Station accounts are kept in balance and reports furnished the station daily. The station agent sends in the daily cash sheet which is posted to the abstracts. Uncollected reports are drawn off by stations each month and the station furnished with a copy. All correction notices are sent out and all adjustments are made by this department as well as all refunds. The draft covering, however, is forwarded to the agent who makes the delivery, the agent taking up the paid expense bill.

This method of accounting results in uniformity and accuracy in abstracting and in keeping the station accounts in balance. The accountant's office is in possession at all times of the amount of uncollected charges, which results in an enforcement control over the agents to collect the charges within the time limit prescribed by the Interstate Commerce Commission, and also results in considerable saving of the traveling auditor's time in the actual checking of the stations, as the verification of the uncollected accounts prior to the current month is handled by mail in the accountant's office.

Tickets Issued by Cash Register Machines. We have now in operation 22 cash register machines issuing tickets sold by agents, and it is our intention to install additional machines in the stations not now equipped just as rapidly as the volume of business justifies the expenditure. These were described in ELECTRIC RAILWAY JOURNAL for Nov. 11, 1922, page 773.

The accounting for machine ticket sales is very simple, as it is not necessary to check a ticket case containing a stock of one-way tickets for each agent. The machines automatically list and total all tickets sold. The agent sends in the machine tape with his ticket report to the auditor of passenger accounts. The tapes indicate the destination point by symbols opposite the amount received for each ticket. These tapes are then tabulated on an analyzing machine that gives the total sales by stations for tickets sold from one station to every other station. This ticket analysis, previous to the machine installation, required the time equivalent to two and one-half employees. One operator now does the work, and in addition is distributing the various classes of accounts for the storehouse and summarizing our daily mileage reports for the month in accordance with our prescribed classification.

We have found by actual test that tickets can be issued more rapidly by machines than card tickets can be issued, and in addition the passenger gets a receipt. There is less opportunity for ticket manipulation as the ticket is automatically canceled when the hat check is lifted by the conductor and placed in the hat check holder. The machines have cut down our investment in printed one-way stock considerably. Ticket paper costs approximately 30 cents per thousand, while card tickets run all the way from 80 cents to $1.25 per thousand.

◆

Effect of the Automobile on Passenger Traffic*

BY DUDLEY MONTGOMERY
Vice-President Madison Railways,
Madison, Wis.

THE past fifteen years have been the most trying in the history of the street railway business. Together with the trials of war and much adverse legislation and criticism, the industry has had to meet the competition of the automobile.

In 1910 we were all worried about the possible diminution of street railway traffic due to automobile traffic, and yet at that time no one conceived of the ultimate growth of the automobile industry. The accompanying charts give the facts from 1910 to 1923, both inclusive, and represent what is considered to be conservative judgment from 1923 to 1930.

The chart for the State of Wisconsin shows the present trend of population and automobile ownership. Assuming that the population between 1920 and 1930 will increase by the same proportion that it did during the previous ten years, and that by 1930 there will be five inhabitants per automobile, we can expect a total of 600,000 automobiles in the state at that time. The chart for the city of Madison shows the probable increase in population, the number of passengers being carried and those that probably will be carried by the electric railway in 1930.

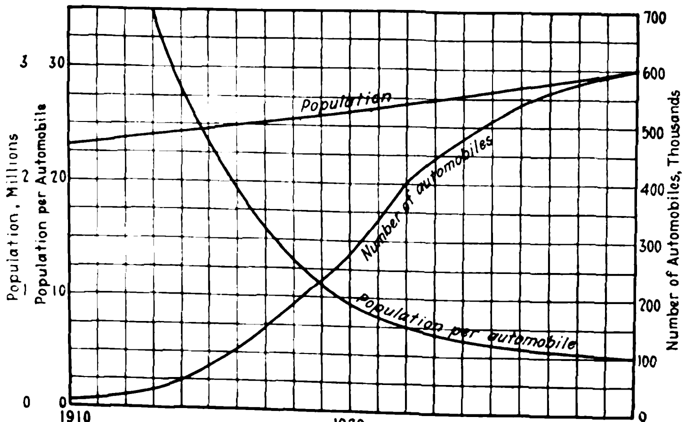
The many predictions of how many automobiles the country could support and the time when the enormous annual increase of production would slacken to a point commensurate with the normal growth of population have usually fallen short of the facts. I would call attention to only one comparison, which seems to provide some measure of future development; that is, that there are now more automobiles in the United States than there are telephones. I believe that an expansion much beyond this point will not prove to be the permanent saturation point.

The number of persons who at present own automobiles but are using them less and less for daily service is increasing steadily. They find that the expense is greater than they care to assume, that the difficulty of finding space to park their cars is an annoyance, that the wear and tear on the automobile standing in the weather is another expense and that the time saved, if any, is of no great moment to them. The result is that they are using their automobiles mostly for pleasure riding.

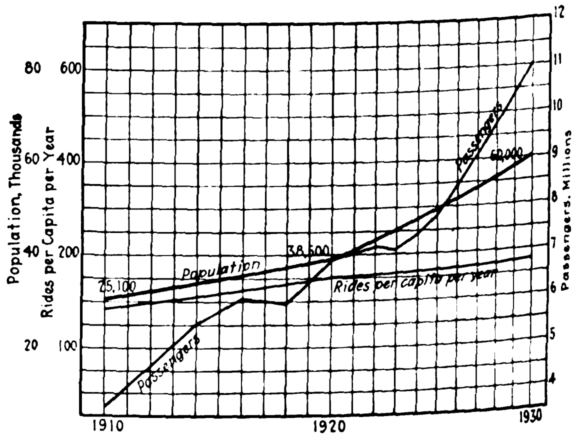
The country is going through much the same kind of experience with the

---

*Abstract of a paper before the Electric Railway Section, Wisconsin Utilities Association, Milwaukee, April 17-18, 1924.



Relation Between Population Growth and Automobiles, State of Wisconsin



Relation Between Population and Street Car Riding Habit, City of Madison automobile that it did with the bicycle, and a part of the novelty of automobile driving is wearing off. This is especially true where traffic congestion is serious enough to hamper and irritate the driver.

For some time we have been collecting data and making observations to determine the amount of traffic which the automobile takes from the street car, and two of the best illustrations which we have are comparisons between the month of March, 1923, and that of April, 1923, and between December, 1923, and January, 1924.

	March, 1923	April, 1923	December, 1923	January, 1924
Passengers	718,400*	630,400	615,100	754,700
Aver. per day	23,950	20,600	19,800	24,300
Difference	3,350	....	....	4,500

*One day no service.

Each of these two combinations of months were comparable in Madison except that the weather in April and December was mild and beautiful, whereas March and January were cold and stormy. If we assume that the automobile travel during March and January was of a nature which used to be carried by horse or was new business peculiar to the automobile, we find that 14 per cent in the first instance, and 18½ per cent in the second, of the total possible traffic was accommodated by the automobile, and from 81½ per cent to 86 per cent by street cars.

From this and other information we find that the street cars are carrying, on the average, 80 per cent, or four-fifths, of the city traffic, and we believe that they will continue to hold this proportion. It must be remembered that the largest part of the automobile riding is new business developed by the automobile and cannot be considered as a loss to the street railways.

In coming to these conclusions, we are not forgetting the possibilities of urban bus operation. Such transportation is more likely to appeal to those now riding in their privately owned automobiles than to street car patrons, and we believe that we can compete with the bus in attractiveness of service. There is no doubt that the street car is still the service of lowest cost, and there is every reason to believe that, as the people settle down to a steadier existence, the street railways can look forward to a normal increase in their business based on increase in population and riding habit.

◆

The Electric Railway Situation Today[*]

Securities Strengthened by Public Appreciation that Railway Is a Necessity and by Earnest Endeavor of Operators to Give Best Possible Service Under More Efficient Methods

By W. H. Sawyer
President East St. Louis & Suburban Railway, East St. Louis, Ill.

THE greatest advancement which has been made in the position of the electric railways has been the appreciation on the part of the public that electric railways, being a national and civic necessity, are entitled without question to make a fair return on a fair value. This has strengthened electric railway securities so that the buying public today has more faith in them as investments. This is especially true of the city electric railways, which today, speaking nationally, are in a fairly healthy condition and merit recognition from the investors. In fact, it is probably true that in the past year's market, which in general has possibly been somewhat inflated, electric railway securities have not come fully into their own.

One reason why electric railway securities are better investments today than before is the appreciation on the part of the investing public of the underlying necessity of electric railways. Another is the increased efficiency in mechanical production shown by the operators. A really fundamental reason is that the 1924 electric railway executive and operator has a more keen appreciation of the fact that it is his duty to give the very best service practicable for the rate of fare charged, and further, that it is his duty to give service in such a way that it will satisfy, in so far as it is humanly possible, the customers and the potential customers of his electric railway.

I care not where you go, there is a different attitude today on the part of the electric railway executive and operator. He wants to satisfy his public. We executives and operators who went through the horrible nightmare during war times learned our lesson and were brought to an appreciation of the fact that part of our troubles were of our own making.

Times and conditions have changed. The old flat franchise fare is gone, never nationally to return. Our customers today in different localities call it by different names, but in the last analysis street car fares today are in most cases based on the cost of the service. In no place does the customer pay more than the cost of the service.

There has for some time been a question in my mind whether regulation practically eliminating profits and practically restricting return on investment to the cost of money would not work out detrimentally in the end, but at the present time the theory of regulation on the basis of a fair return on a fair value and no more is, I am frank to say, giving very general satisfaction. There has also been a question in my mind whether the electric railway operator would be as efficient if all the efficiency went to the benefit of the car rider, but today this generation of electric railway executives and operators is more efficient than ever before. We have too big a job before us today to grow pessimistic over the possibilities of what may happen in the next generation. If, however, we continue to have regulation, and the customer is protected from paying more than the cost of the car ride, including, of course, a fair return on a fair value, it is essential that careful thought be given by all to see to it that the investor is given a fair return on a fair value. Otherwise there will be no investors, and then there will be no electric railways —but that to me is unthinkable. Electric railways must continue and investors must, therefore, continue to be willing to invest in electric railway securities, and the people must, therefore, continue to be willing to allow the investor a fair return.

Another new phase which has come about due to the general adoption of this service-at-cost idea is the desire on the part not only of the electric railway companies, but of their customers also, to have eliminated those items of expense which are not part of the cost of the car ride. Years ago when conditions were different, when there was no regulation, when there was a flat rate of fare, every concession forced out of the company was considered a benefit to the civic community. Under today's condition expense saddled by the community on the car company is paid by the car rider. The company and the customers both want to see the lowest practicable fare for good service. The company and the customers both want to see all unfair expense eliminated from the cost of the car ride.

One of the best illustrations of an unfair expense charged against the cost of a car ride today is the paving tax. In communities working under old-time franchises the car rider still pays for the paving between the car tracks, although this paving is not needed by the car rider, is not worn out by the car rider, and does not even deteriorate due to the electric cars. It is in keeping with the spirit of changed conditions that new franchises are eliminating this paving tax, and rightfully so. The car rider should not pay for paving worn out by vehicle owners.

Upon examining some figures a while ago I noticed that the Kansas City Railway had invested in pavements and viaducts more than $5,000,000. It seems unthinkable that a company with gross earnings of only about $10,000,000 should have to invest more than $5,000,000 in pavements and viaducts, and maintain and keep in repair such pavements and viaducts. Interest, depreciation and taxes should certainly be taken as high as 10 per cent on this $5,000,000. This means $500,000 a year to be paid by the car rider for fixed charges on pavement and viaducts. To maintain this paving alone would cost on the average approximately $200,000 a year.

I am not well enough acquainted with the local situation to hazard an approximation as to the cost of maintenance of viaducts, but there is no question but that the street car riders in Kansas City pay, exclusive of regular state, county and city taxes, upward of $800,000 a year for indirect taxes which no other business is called upon to pay. There is no question but that the Kansas City car rider has to pay considerably more than ½ cent of his car fare for these inequitable indirect taxes. It is therefore not to be wondered at that where new franchises are being granted the car riders are asking for the elimination of these indirect taxes and imposts.

---

[*] Abstract of paper presented before Missouri Public Utilities Association at Kansas City, Mo., April 9, 1924.

In some instances the street car company is asking for the elimination and it is being opposed by the elected representatives of the community. This is, I believe, due to the fact that there is not yet a full appreciation of the fact that the car rider must eventually pay for the cost of the car ride—and no more. Once this fact is appreciated and understood, mayors, city councils or city commissioners will not ask that the burden of these indirect taxes be put upon the car riders, who are mostly the working class of people, for the benefit of the community at large.

RAILWAY MEN STUDYING THE BUS

No electric railway man gets to his feet today to talk without touching upon what we call the bus situation. It was only a few years ago that electric railway men shuddered at the mere mention of the word "buses." They had in mind the jitneys, which for a long period almost sapped the lifeblood of many companies, including the local company here in Kansas City. The average electric railway man is not disturbed today when you mention buses. It is one of the problems which he is studying—studying from an analytical, unprejudiced standpoint. Buses are going to be used more and more as time goes along by electric railway men in fulfilling their transportation duties to their communities. In many cities the electric railway man is today rightfully using a considerable number of buses to supplement and round out his transportation service.

There are objections to buses, especially in some localities, and especially on some streets in some localities. The bus as a vehicle does not carry as many people as the street car does as a vehicle, and from the status of the art today it is impracticable for it to do so, and to transport the same number of people therefore requires more buses than street cars. Bus transportation costs more per passenger carried than does street car transportation. Buses add materially to the downtown congestion, which is one of the biggest problems electric railway men and civic communities have to solve. I do not believe that bus operation should be independent of the street and interurban car facilities, but I do believe that every electric car man should give serious thought as to whether buses operated by the railway company are not necessary to round out and complete the transportation needs of his community. But buses should not be allowed to compete in such a way as to take away the cream of the traffic from the electric cars in which the people now have their money invested, and upon which the people finally must depend for service.

A short time ago while in Chicago at a convention similar to this I listened to a well-meaning man talk about educating the public by the use of publicity. I took the ground that the man meant right but that he was wrong in his phraseology. The public does not need to be educated, but we need to be educated, we electric railway executives and operators. I think the facts are that none of us are yet fully educated either as to the proper quantity or quality of publicity or advertising, but we are on our way, we are on the right path, in that we are today conducting our business as other successful men conduct their businesses, giving full service for value received, giving efficient service, and acquainting our customers through the newspapers with all the facts surrounding our business, which in the final analysis is really their business.

I. C. C. Considers Mail Rates

Association Committee Presents Extended Report on Proper Basis for Determining Charges to Be Paid for Electric Railway Mail Service

THE question of the proper charges to be paid by the Post Office Department to the electric railways for the haulage of mail is now before the Interstate Commerce Commission. For years the electric railways have believed that they were underpaid for the services which they render in the haulage of mail matter, and under the direction of a committee of the American Electric Railway Association they have been endeavoring to secure an increase. The last rate schedule established by the Interstate Commerce Commission went into effect Dec. 1, 1920, but has been found inadequate in a number of particulars. Since that time both the association and the department have been compiling data on the subject and these data have been presented as exhibits to the commission. The final step in the effort to secure fairer rate for mail service took place April 10, when W. H. Maltbie, as counsel for the association, filed with the commission a brief discussing the evidence so far submitted. This brief occupies a pamphlet of about 116 pages. The following is a summary of the principal points made in it:

THE PRESENT RATES

Briefly, the present rates are:

Class I. R.P.O. service.—In this service the railway furnishes and transports either a full car or a compartment for the exclusive use of mail, but all the work in connection with the handling of the mail is done by the regular employees of the department. The rate is based per car mile on the linear length of the car, or compartment, as follows: For each linear foot of car length up to 20 ft., 1¼ cents per mile; for each foot of length over 20 ft., ¾ cent per mile.

Class II. Independent cars.—This class covers those cases where the car or compartment, at least during the time when it carries the mail, is used exclusively for the post office department, but the mail is handled by the employees of the transportation company. The present rates allow for the additional service of handling and responsibility for the mail an additional charge of ¼ cent per mile for each foot of car or compartment length up to but not exceeding 20 ft.

Class III. Closed pouch service in baggage or express cars or compartments.—In this form of service the mail is carried, with other express or baggage, in a baggage or express car or compartment. It is handled entirely by the employees of the transportation company and is given preferential treatment in that space must be provided for any quantity tendered, and as the space occupied must be carried after the mail is discharged to the end of the run, an additional allowance is warranted. The rate which has been paid for this service is 1 cent per mile per foot of car length used for mail, plus a surcharge of 2 cents per car mile to cover handling, preferential treatment, excess haul and responsibility, but applicable only to the first unit of each shipment. In other words, this surcharge is 2 cents per shipment-mile.

Class IV. Closed pouch service in passenger cars or compartment.—This comprises cases where the mail is carried in passenger cars or passenger compartments, all handling being done by the company. As there is even greater responsibility in protecting the mail against loss and damage than in Class III, the rate is slightly higher, i.e., the base rate is the same as Class III, but the surcharge per shipment-mile is 3 cents instead of 2 cents as in Class III.

BASIS OF THE PRESENT CASE

After an experience of about two years, the railway companies requested the reopening of the case on the ground that the rates were inadequate. To determine what were fair rates, a questionnaire was prepared by co-operation between the representatives of the post office department and those of the American Electric Railway Association, designed to secure the information desired by both parties. Many valuable data were secured. These data have been accepted by both parties. Some testimony was also presented during the hearings through witnesses, particularly by A. S. Richey and Thomas Conway, Jr. Some of the points in which it was found that the department and the companies differed will be mentioned.

The method of determining the revenue length of car, particularly the extent to which the platform should be considered as part of the length of car, was one point of difference. In an effort made to determine the actual cost to the company of the service, there were differences in opinion as to the proper method of apportioning some of the expenses, whether the Federal income tax should be treated in the accounts as an operating expense and the proper "fair return" to allow, the department proposing 5¾ per cent and the carriers asking for 8 per cent of the fair value. There was also a disagreement as to the space to be considered as "occupied," particularly in Class IV service.

CARRIERS PROPOSE RATES

The position of the carriers before the Interstate Commerce Commission was that the rates should be based on the cost of service, plus a fair return, but that as the cost varies with each city, it is more practicable to take the average cost of all electric railway transportation as a base rate. In the absence of operating figures for the entire country, the average figure of the 151 railway companies from which data were obtained in this study of mail rates is taken. Then the cost per car foot mile may be obtained by dividing the total operating expenses and other costs of the railway systems by the total revenue car foot mileage. The "fair value" of the properties, for the purpose of this determination, may then be taken as 4.35 times the total annual operating expenses, and on the value thus obtained, the fair return should be figured at 8 per cent.

In developing the reasonable rate on the basis of this cost, the carriers' brief said that in general mail service is divided into three classes: (A) Full car service, (B) full compartment service, and (C) fractional service. Classes A and B are subdivided according to whether mail is handled by the post office employees or by the railway employees, and Class C is subdivided according as the fractional service makes use of freight, express or passenger equipment.

The brief then says that the proper basis for rate making is the cost per car mile or the cost per car foot mile, plus a fair return, with proper discount from the car mile rate for short length cars and proper surcharges for: (a) Special service not demanded in passenger traffic, (b) fractional or l.c.l. service, (c) necessary excess run, due to demand for service between points other than termini of existing car runs and (d) the fact that the mail service is an ordered service.

The brief then points out that the revenue length of the car should be taken to include one-half of all platforms. The rates per car foot mile would then be shown in the tabulation at the top of the next column.

COMPUTATION OF CAR FOOT RATES

1.	Total number of cars covered by study	26,502
2.	Total number of car miles	574,892,000
3.	Car-foot miles (Post Office Department's estimate)	20,742,000,000
4.	Increase in item 3, due to addition of one-half of platform length in freight, express, mail and express-mail cars, and one-fourth of platform length in passenger—express and passenger—mail cars	0.251 per cent
5.	Corrected total car foot miles (item 3 multiplied by 1.00251)	20,793,000,000
6.	Operating expenses	$204,084,942
7.	Taxes, other than federal income tax	$15,852,192
8.	Federal income tax	$1,080,191
9.	Miscellaneous debits	50,557
10.	Lease of road (net balance)	5,376,206
11.	Total cost, exclusive of fair return	$226,444,088
12.	Total cost per car mile in 1921, exclusive of fair return (item 11 divided by item 2)	39.38 cents
13.	Total cost per car mile, October, 1923, exclusive of fair return (97 per cent of item 12)	38.20 cents
14.	Total cost per car foot mile in 1921, exclusive of fair return (item 11 divided by item 5)	1.089 cents
15.	Total cost per car foot mile, October, 1923, exclusive of fair return (97 per cent of item 14)	1.056 cents
16.	Fair return expressed as a percentage of fair value	8 per cent
17.	Ratio of fair value to total operating expenses	4.35
18.	Fair return expressed as a percentage of operating expenses (item 16 multiplied by item 17)	34.8 per cent
19.	Car mile cost plus fair return, October, 1923 (1.348 times item 13)	51.49 cents
20.	Car foot mile cost, plus fair return, October, 1923 (1.348 times item 15)	1.42 cents

THE BRIEF SUGGESTS TWO METHODS

In applying the rate thus obtained to the full car R.P.O. rate, the brief suggests two methods. One is that the full car mile cost of 51.49 cents be subject to a discount of 25 per cent for cars less than 28 ft. The other is that there should be a base rate of 65 per cent of the total car mile cost of 51.49 cents, or 33.46 cents, to which there should be added for each foot of car, 35 per cent of the car foot rate of 1.42 cents, or 0.50 cent per mile.

Where the railway company pays the labor costs for handling, an additional charge of 1.5 cents per linear foot per mile is recommended, pending a more accurate determination of the cost, with a reduction to 0.75 cent per linear foot per mile for full car or full compartment service. For R.P.O. apartment service, the rate recommended is the base rate of 1.42 cents per linear foot of apartment, plus the present short length surcharge of 25 per cent for the first 20 ft. and 25 per cent discount for any portion of the apartment over 20 ft. in length.

The suggested rates for closed pouch or express car or compartment service are based on a unit of 30 cu.ft. This figure is obtained on the assumption that 30 cu.ft. are equivalent to 1 linear ft. of an 8-ft. car, in which mail is piled to a height of 5 ft., with a 2-ft. aisle. The rates recommended are:

CLOSED POUCH BAGGAGE OR EXPRESS CAR OR COMPARTMENT RATE

(For Units of 30 Cu.Ft.)

	Cents per Mile
First unit	4.5
Second unit	4
Third unit	3.5
Fourth unit	3
Additional units	2.75

CLOSED POUCH PASSENGER CAR OR COMPARTMENT RATE

	Cents per Mile
First unit (10 bags)	7
Second unit (sufficient volume to make total for first and second units 60 cu.ft.)	6
Third unit	5
Fourth unit	4
Additional units	3.5

The brief explains at length the basis for these figures, and includes, in the data given, interesting figures on the average load factors on cars on different railway systems. The load factor, in this connection, is defined as the revenue passengers per car mile, multiplied by the average length of ride in miles, and divided by the average seats per car. Recent figures for various properties were declared to be:

	Per Cent
Easton (Pa.) Transit Company	37.43
Nashville Street Railway	39
Public Service Railway of New Jersey	39.72
Springfield (Mass.) Street Railway	46.8

Recent figures on average length of rides in different cities were also quoted. They are given in the following table:

	Miles
Cleveland, Ohio	3.11
Chicago, Ill. (surface lines)	4.16
Detroit, Mich.	4.06
Milwaukee, Wis.	2.93
Nashville, Tenn.	2.5
Philadelphia (surface lines)	2.71
San Francisco, Cal.	2.4
Springfield, Mass.	2.88
Worcester, Mass.	2.5

In connection with the proposed rates, the carriers declare that there should also be a minimum charge for a mail route, but as it is difficult to determine with any degree of accuracy what it should be, they suggest a minimum charge not less than 1.42 times the one at present in force. This will make the new minimum charge approximately $250.

New Reports Available

SPECIAL reports and compilations on the following subjects prepared by the association staff during the past month are now available to member companies upon request.

Working Conditions of Trainmen: A new edition of the association's regular bulletin based on up-to-date information covering hours of labor, length and types of runs, layover time, overtime rates, extra compensation allowed for special types of work, number of trainmen, labor turnover, etc.

The Problem of Traffic Congestion: Extracts from reports of traffic surveys and leading articles on the traffic problem in city streets giving a general survey of traffic conditions and brief specific surveys of some of the leading cities, including descriptions of methods adopted to relieve congestion in certain cities, the results obtained and also some theoretical solutions of traffic problems which have not actually been tried out. Discussion of the comparative efficiency in the use of the streets by passenger automobiles, buses and street cars is also included.

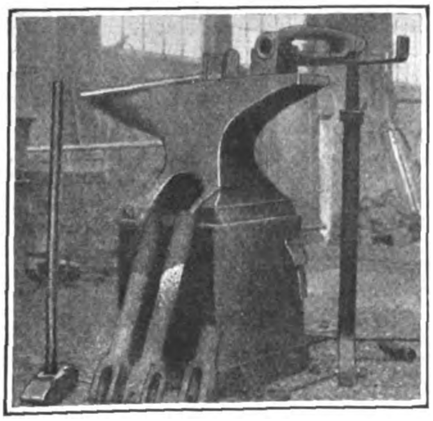
Trend of Trainmen's Wages in 1914 to 1923: Shows for a large group of companies the maximum wage rate and the number of years of service necessary to reach it for the years 1914 to 1923, inclusive.

In addition to the above, supplements to the Wage Bulletin, Fare Bulletin and Cost of Living Studies have been prepared, bringing them down to date.

Maintenance of Equipment

Closing Ends of Turnbuckles for Rethreading

WHEN the threaded ends of turnbuckles become worn, it is desirable to rethread them. This requires that the hole be closed in sufficiently to permit the tap to cut a thread of standard size. This work is carried on very efficiently in the shops of the Philadelphia & Western Railway, Norristown, Pa., by use of swages of the particular shape necessary for the hexagonal ends of the turnbuckles. In closing in the ends, the turnbuckle is heated in a forge, and the end is placed in the bottom swage which is placed in the hardy hole of an anvil. The top swage has a handle. When this is held in position on top of the turnbuckle a couple of blows from a sledge will close in the end and retain the proper exterior shape. After the turnbuckles have been cooled they are again threaded in a bolt threading machine.



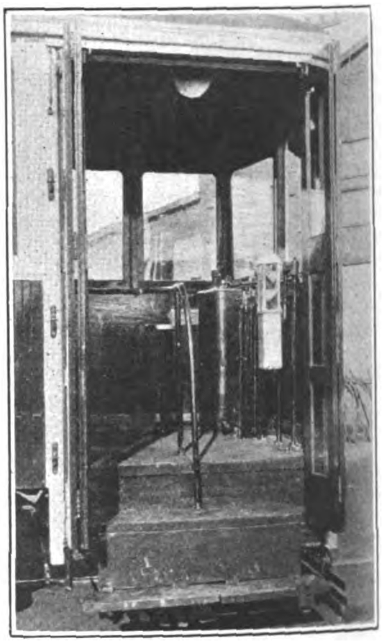
Turnbuckle in Position for Closing in Ends

Threads on the brake rods also become worn. If there is sufficient stock remaining the rods are upset and rethreaded. Otherwise they are cut off at an angle, and a new end is welded on. This is then rethreaded to proper dimensions.

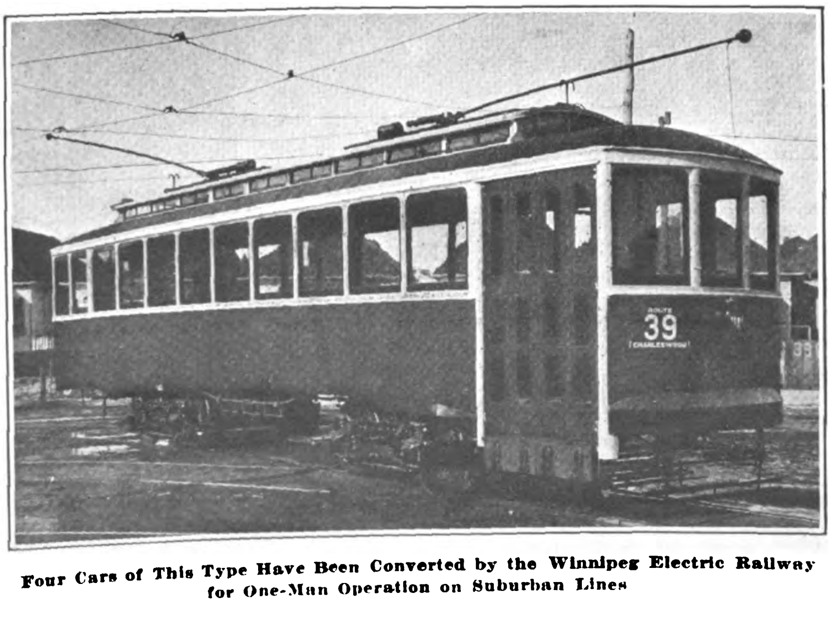
Protect Passengers Against Drafts

SEVERE climatic conditions prevailing in Manitoba have influenced the design followed in the reconstruction of four double-truck double-end cars by the Winnipeg Electric Railway. These have been converted into one-man safety cars for service on suburban lines. Swinging doors separate the interior of the car from the vestibule in order to protect the passengers against drafts.

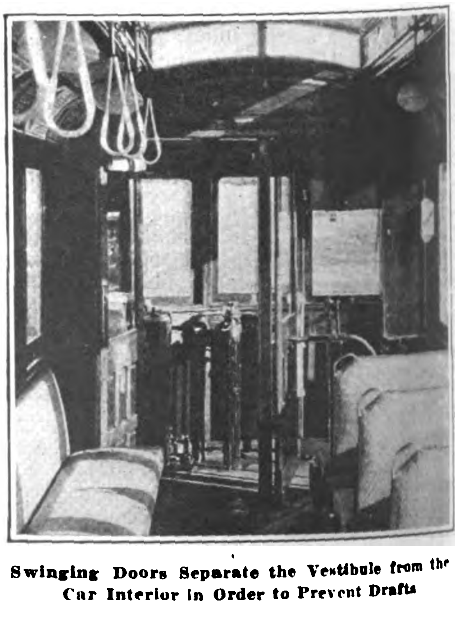
The platforms are flush with the car floor, but there are two steps between the platform and the ground. The lower step is of the folding type and is connected with the door operating mechanism. A second step is in the form of a well inside the doors. This arrangement prevents drafts entering the car through a crack under the doors. Entrance and exit doors are operated individually by means of a selective mechanism manufactured by the Safety Car Devices Company. The cold air coming in the car interior is thus reduced to a minimum. A Peter Smith heater is located in the center of the car in order to distribute the heat evenly.



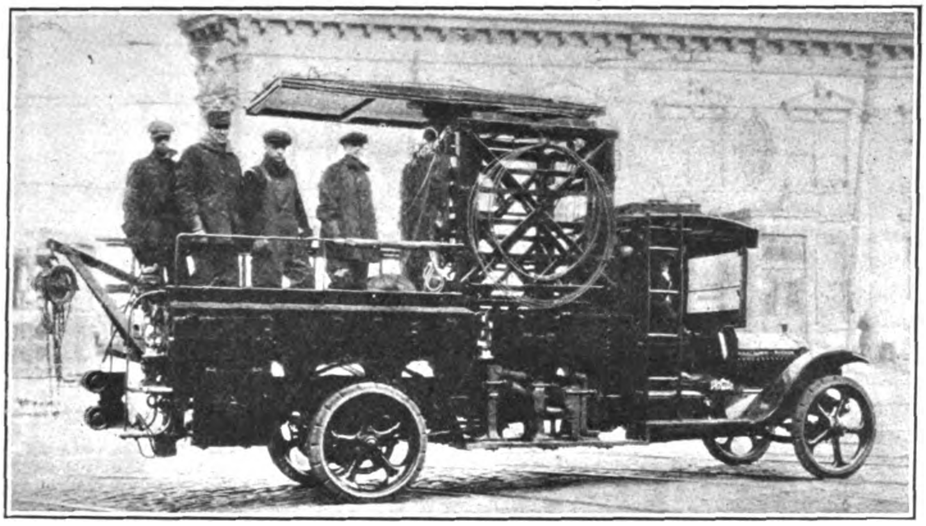
Double Doors, Separately Controlled, and Step Arrangement on Rebuilt Winnipeg Cars



Four Cars of This Type Have Been Converted by the Winnipeg Electric Railway for One-Man Operation on Suburban Lines



Swinging Doors Separate the Vestibule from the Car Interior in Order to Prevent Drafts



Combination Truck for Line Maintenance and Emergency Car Work

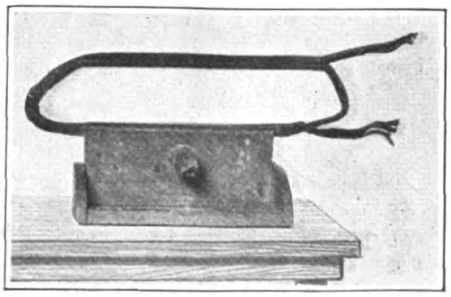
Combination Line-Emergency Truck

A NEW truck which can be used for overhead maintenance as a line truck and as an emergency truck for rolling stock has recently been placed in service by the New York & Queens County Railway, New York, N. Y. The chassis is a White 2½-ton model with a McCardell three-section tower mounted on it. Special running boards are provided on the sides and three jacks are carried on either side and a stone jack on the rear step, making a total of seven jacks carried by the truck. A four-wheeled buggy for moving vehicles with broken axles is also carried on the rear. Provision is made for a portable hoisting arm, which may be attached to the rear end and used for hoisting an automobile that has been disabled on the track. This hoisting arm functions the same as the hoist on an ordinary garage wrecker and when not in use it is slid into a compartment located under the truck flooring. A full set of materials and tools for maintaining overhead lines is carried on the truck as well as the wrecking tools.

In addition to this tower truck, the company has also placed in service a Ford 1-ton truck, and through the addition of these two is able to retire a stable of five horses, two horse-drawn tower trucks and two horse-drawn freight trucks and to eliminate one line crew. By the use of the new trucks for car emergency calls a wrecking car previously used by the company has almost been eliminated.

Vise Holds Armature Coils

A HAND VISE constructed of wood of the type shown in the accompanying illustration has been found a great convenience in the armature room of the Eighth Avenue Railroad, New York. The hand vise is made entirely of wood with two upright jaws mounted on a wooden base. The front jaw is moved back and forth through the use of a hand screw in the center. The armature coil to be taped can be placed in the vise and quickly fastened. In taping coils it is most convenient to provide so that they can be swung around at various angles during the taping process. The particular advantage in using a hand vise of the type shown is that this can be fastened to the bench by a "C" clamp and can then be shifted to a position most convenient for the winder.

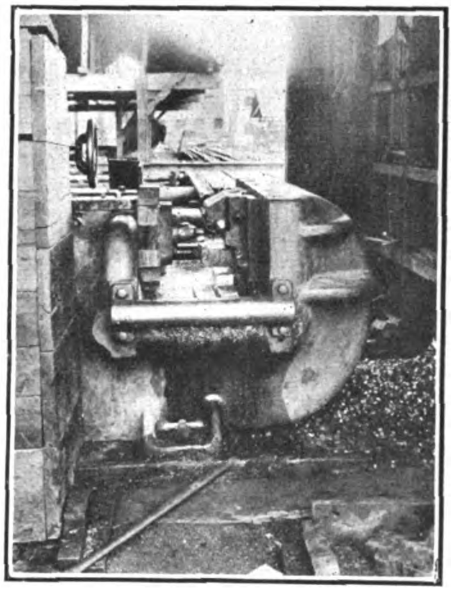


Convenient Form of Hand Vise for Taping Armature Coils

Rail Saw, Punch and Bender

RAILWAY systems which are a long distance from the producer have to install more shop and yard equipment than if they were closer to the source of supply. Among the appliances owned by the Spokane United Railways, Spokane, Wash., is the extensive installation for cutting, punching and bending rails shown in the accompanying line illustrations.

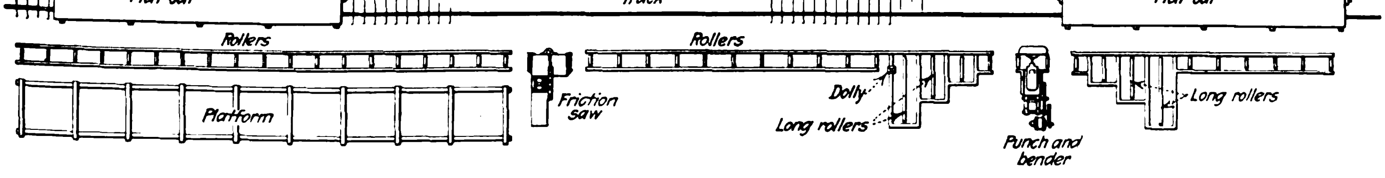
The plan shows the track on which flat cars, loaded with rails to be cut and punched, are brought into these yards. From these cars the rails are skidded to an adjoining platform and are then placed on rollers which carry them to the friction saw. Here the worn ends are cut off. They are then run down another set of rollers to the punch and bender, where the ends are punched or the rails are bent.



This Machine Punches and Bends Rails

It will be noticed that the rollers on each side of this bender are of various lengths. These are to permit the 60-ft. rails, while being bent to a short radius curve, to lie workwise on the rollers.

An accompanying illustration shows the bender and punch used as a punch. In the background will be seen the rail saw and roll-way. It will be noticed that both rail punch and rail saw are housed to protect them from the weather.

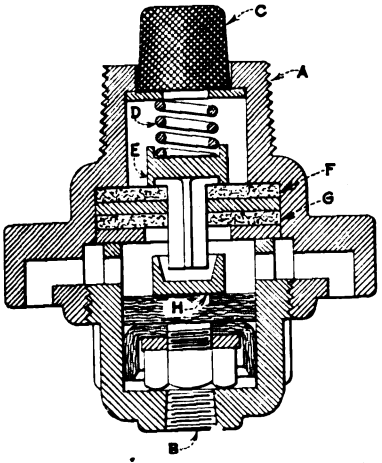


Plan of Installation for Cutting, Punching and Bending Rails in Spokane

New Equipment Available

Automatic Drain Valve for Car Reservoirs

A NEW type of automatic drain valve for car air reservoirs is being placed on the market by the Columbia Machine Works, Brooklyn, N. Y. The action is somewhat similar to the air-operated slack adjuster for brakes, in that each application of the air causes the discharge of the water accumulated in the reservoir since the last brake application.



Automatic Non-Cumulative Drain Valve

In this way the water is removed practically as fast as it is condensed, and does not have a chance to freeze and prevent proper action of the brakes.

The manner in which the device operates may be seen from the following description:

Referring to the accompanying diagram showing the construction details, the threaded part, marked *A*, is arranged to screw into the main reservoir. There is a pipe connection at the bottom from the opening *B* to connect with the brake cylinder of the car. With each application of the brakes air is admitted from the brake cylinders through the opening *B* to the drain valve.

With the valve in position in the main reservoir, any water which may accumulate passes through the strainer *C* and into the valve chamber *D*. A small valve, *E*, is held on its seat at *F* by the main reservoir air pressure and also by a spring which seats on the top of the valve.

With each application of the brakes, brake cylinder pressure is admitted at *B*, which raises the valve *H* and also valve *E*. This produces an opening from the chamber *D* to atmosphere, so that any moisture which accumulates in this chamber is blown out as the valve is lifted from its seat. When the valve *H* reaches its upper position it seats against the rubber gasket *G*, and thus closes the opening to atmosphere. With the release of the brakes the valves again take their normal position and in so doing there is again a short blow of air from the chamber *D* to atmosphere, which carries any moisture out of the chamber *D*.

This type of valve has been installed upon a number of electric cars, and is giving satisfactory results. It is made entirely of brass, and is arranged to screw into the main reservoir in place of the usual drain cock.

Removable Top for Double-Deck Bus

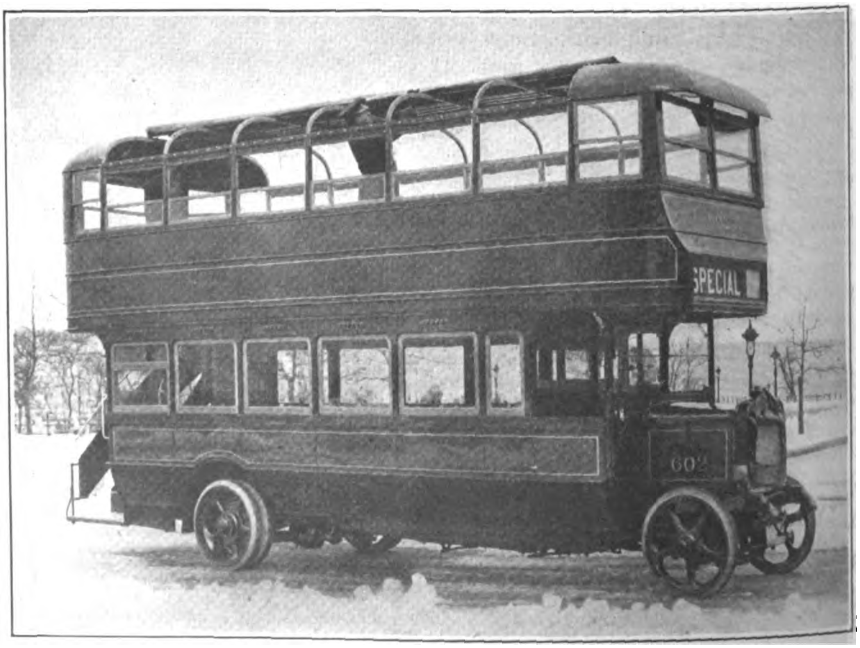
A DOUBLE-DECK bus seating 64, with a top designed to make the upper deck comfortable every day in the year, has been placed in service by the Fifth Avenue Coach Company, New York. To make the 38 seats on the upper deck available in cold and inclement weather and at the same time have the upper deck attractive for open-air riding on pleasant days a removable semi-glass inclosed top equipped with drop curtains and a roll cover roof of light waterproof material has been provided.

The top is bolted to the rail of the upper deck and is inclosed both front and rear with glass and a permanent section of roof. There is also a permanent roof over the aisle. On each side of the aisle roof is a roll cover, which, when lowered, forms the roof from the aisle to the top of the windows. These two roll sections can be lowered in a few minutes by the conductor.

The lower half of each upper deck window is covered with a fixed 10-in. glass panel, while the upper portion may be closed with a roll shade. This, when lowered, overlaps the upper edge of the glass panel, so that rain, snow or sleet cannot get in. With the overhead covers and side curtains down there still is plenty of light entering the inclosure through the front, rear and side sash. Electric lights mounted just above the windows illuminate the interior at night.

In general appearance the bus shown in the accompanying illustration resembles No. 601, a 60-passenger double-decker, which was exhibited at Atlantic City last October. The additional seats in No. 602 have been provided by extending the upper deck beyond the driver's vestibule. This also affords additional safety when driving, as the overhang forms a visor to the windshield, protecting it from rain or snow.

The new bus was manufactured by the New York Transportation Company.



Sixty-four-Passenger Bus with Removable Top Equipped with Roll Roof and Side Curtains. This Arrangement Is Designed to Make the "Open Deck" Usable All Year

The News of the Industry

Subway to Replace "L"

A Four-Track Trunk Line to Be Built on Sixth Avenue, New York City, Within Five Years, Maybe

A subway under Sixth Avenue, New York City, extending from Trinity Place to Fifty-ninth Street was recently approved by the Transit Commission. Later the commission suggested the subway be extended under Central Park and then east to Queens. It will be a four-track trunk line and as approved is an adaptation of the proposal first advocated by Julius Miller, Borough President of Manhattan, for tearing down the Sixth Avenue elevated and constructing a subway in its place, provided the property owners along Sixth Avenue pay the cost of the change through assessments. A large number of them have consented to a 10 per cent assessment, believing this would cover the cost as outlined below. But the commission points out that the cost will require a 20 per cent assessment. The elevated structure is not to be removed until after the completion of the underground system.

Cost Estimated at $60,000,000

The commission points out that the estimated costs are affected by the existence of the Hudson & Manhattan structure in Sixth Avenue from Ninth Street to Thirty-third Street. Of the four new tracks, two used for express purposes will have to be built beneath the existing Hudson and Manhattan tracks, and of the two used for local purposes one must be built on either side of the existing tracks and at a depth sufficient to avoid interference with the Hudson & Manhattan stations. Other engineering difficulties will be met in dipping the new line under the Pennsylvania Railroad tubes at this point. These engineering difficulties will add about $7,000,000 to the cost of the subway.

The engineers estimate that the mere destruction and removal of the Sixth Avenue Elevated line would cost $500,000, less whatever sum might be realized through the sale of the scrapped material. Further, that the amount of the award the courts in a condemnation proceeding would allow the railroad for its property is entirely conjectural. But in allowing $49,000,000 as the cost of the subway, the commission assumes that the total cost of acquiring and destroying the old line and of building the new would be not far from $60,000,000. It also says that during the year ended Dec. 31, 1923, 153,409,605 passengers were carried in both directions by the two lines, the Sixth and Ninth Avenue branches, from Rector Street station to the terminus of the joint line at Anderson and Jerome Avenues in the Bronx. Traffic checks indicate that 60 per cent of this total, or 94,000,000, were carried either to or from stations on the Sixth Avenue branch, and approximately 59,000,000 to or from stations on the Ninth Avenue branch below Fifty-third Street.

Details of Detroit Trackless Trolley Plan

The Detroit Department of Street Railways plans to use trackless trolleys as feeders to the East Warren extension. Announcement to this effect has been made to the City Council by Ross Schram, assistant general manager of the municipal system. Extensions of the tracks for about 1½ miles are planned and if the trackless trolleys are found available they will probably be run from ½ mile to 1 mile beyond the terminus of the proposed track extensions.

The costs of laying tracks and providing overhead lines is estimated at $100,000 per mile, while for trackless trolleys the cost of the overhead equipment is placed at $10,000 a mile, with cars costing about $9,000 each.

The municipal officials plan on putting a number of trackless trolleys in service in the outlying districts where the population does not warrant the laying of expensive tracks, provided the cars sent for examination and experiment prove satisfactory, as the city was authorized by a charter amendment passed two years ago, to purchase and operate trackless trolleys.

Announcement has been made that the D.S.R. officials expect to pay up within five years the $5,000,000 bond issue voted last spring by the aid of monthly sums set aside from the earnings. The monthly sums will take care of the interest on these bonds and part of the principal. The new cars purchased are to be paid for without depleting the bond issue or financing by so-called car trust certificates. As the cars are delivered, it is planned to have the controller obtain the necessary money on notes, charging the payments to the fund for additions and betterments.

The notes are to be taken up with a fund established by the setting aside of a definite monthly sum. It is anticipated that all of the notes will be written off in a maximum of five years, $4,000,000 having been spent for rolling stock.

The $1,000,000 available this year from bonds, it is estimated, will take care of all reasonable demands for extensions and will be sufficient to build 10 miles of track. While petitions have been received asking for the construction of from 30 to 50 miles of track, only 20 to 25 miles of track are necessary now, according to Mr. Schram.

City Would Buy Lines

Purchase Negotiations Under Way in Chicago—Proposal First Step in Plan to Co-ordinate Service

Negotiations between representatives of the city of Chicago and officials and representatives of security holders of the Chicago Surface Lines and Chicago Rapid Transit Company on the subject of municipalization of Chicago transportation systems are being carried on in a series of meetings held in Mayor Dever's office. These meetings, which are being held at the invitation of the Mayor, have for their purpose the formulation of a plan whereby the city may purchase the transportation properties by the issuance of so-called "Schwartz certificates."

Preliminary negotiations on the subject of the proposed purchase have been under way for some time between legal representatives of the city and of the security holders. In addition to the question of the legality of the proposed Schwartz certificates, which must be definitely determined in order to assure their marketability, the price to be paid for the railway properties and the organization and control of the proposed board of control which would operate the combined properties must be settled before further progress can be made.

Companies in Receptive Mood

The Mayor's proposal to purchase the existing transportation properties is the first step in his general plan for the co-ordination of the service of the elevated and surface lines, to be followed by expansion of the existing systems, and the construction of subways.

At a meeting held in the Mayor's office on April 22 there were present Samuel Insull and Attorney Patrick J. Lucey for the Chicago Rapid Transit Company, Henry A. Blair and Leonard A. Busby for the Chicago Surface Lines, together with Frank O. Wetmore, president of the First National Bank; A. W. Harris of the Harris Trust & Savings Bank, and M. A. Traylor of the Illinois Merchants Bank. As representatives of the city there were present Mayor Dever, Corporation Counsel Francis X. Busch and Alderman U. S. Schwartz, chairman of the local transportation committee. Another meeting of the conferees was set for April 24.

Mr. Busby had previously indicated that the management intends to do everything possible to reach an agreement with the city on a basis which will recognize and adequately protect the rights of the owners of the property and accomplish the city's desired purpose of bringing about a unified transportation system, with adequate provisions for extensions and improvements to meet present and future transportation needs.

More One-Man Cars

Buffalo Company Changing Over to One-Man Equipment Except on Main Lines

One-man cars are being placed in service on a majority of the local lines in Buffalo by the International Railway as part of an economy campaign. Herbert G. Tulley, president of the company, explained the International sustained a deficit of $1,000,000 last year and it is essential that every operating economy known to electric railway practice be used in Buffalo.

Trainmen operating one-man cars on the local lines of the International receive 5 cents an hour more than the regular scale. It is said that none of the present trainmen will lose his position because of the operation of cars with only one man, but that the company will stop hiring new men for a short time.

The one-man system of car operation is being adopted on all the lesser traveled lines in the city. One-man cars now are being operated on the William, Abbott Road, Elk, Hoyt, Connecticut, Clinton and Chicago Street lines. They will soon be placed in service on the Jefferson line and on May 18 the new system will go into effect on the Sycamore Street line. Other lines will be added to the list as rapidly as the cars can be changed over in the company's shops.

HEADWAYS REDUCED

On the Sycamore Street line, where the new system will go into effect on May 18, the headway will be reduced from ten and a half minutes to seven and a half minutes at midday and during the rush hours from three minutes to two and a half minutes. A similar plan will be followed on other lines where one-man cars are being placed in operation.

Mr. Tulley says that an investigation covering a period of a year on lines where one-man cars have been in operation shows that accidents during loading and unloading have been reduced to a minimum. He said that on lines operating cars with two trainmen there has been an increased number of accidents during loading and unloading.

The one-man cars will not be placed in service on the more heavily patronized through lines in the city where speed in starting and stopping in congested areas is essential in order to keep to schedules.

The City Attorney has advised the City Council that there is nothing in the franchise or in the city ordinances which would force the company to operate cars with crews of two men. This opinion by the city law department has kept the Council from seeking the aid of the courts to require the company to man cars with two men.

Buses and Trucks Supplementing Service in Utica and Rome

Motor buses and express trucks are supplementing the electric service of the New York State Railways on the Utica, Rome and interurban lines. Beginning April 28, a large passenger bus will operate between the American Corner and railroad station in Rome, in addition to the 20-minute trolley car service. The bus body was constructed in the railway shops at Utica and has a seating capacity of 25 persons. It is mounted on a Brockway chassis.

Utica has a passenger bus of the same type which is used mostly for sightseeing purposes. The route is over the city's beautiful boulevard. This bus is equipped with a body built by the Kuhlman Car Company and has a Brockway chassis. Early in June the company will inaugurate a commercial trucking service between Rome, Utica and Little Falls and intermediate points. Four White automobile chassis have been purchased and bodies are now under construction at the company shops. The express line will be operated under the name of the Utica Railway Coordinated Bus Lines Inc. The trucks will be of 2½ and 3½ ton capacities.

Seven and Three-Quarter Cents Needed in Baltimore

Hearing on a petition filed by the United Railways Company, Baltimore, to be permitted to put into effect a new schedule of rates and charges was started by the Maryland Public Service Commission on April 22 and is attracting great public attention. The hearing is expected to continue for several days. The original petition as filed by the railway company did not fix a specific figure to which it desired to increase the fare from the present 7-cent rate. On the first day of the hearing it was said by the counsel of the United that in order to accomplish what it desires he believes the company should have a rate of about 7¾ cents.

The original petition asked that the company be permitted to maintain rates which would yield an annual net income of $1,500,000. This figure was cited because in 1920 the Public Service Commission set $1,000,000 as the minimum annual net income and the company pointed out that at the same time the commission had decided that $1,500,000 was "reasonable, necessary and in the public interest" and placed upon the company the burden of increasing the net income to that figure by exercising economy and efficiency.

The figures placed before the commission at the opening of the hearing were submitted by William H. Maltbie, counsel for the United. Joseph C. France, also representing the company, addressed the commission on the need of additional revenue on the part of the railway. In its petition as filed recently the company said that in 1923 only $976,266 was earned and in the four years from Jan. 1, 1920, to Dec. 31, 1923, the total net surplus was $3,454,365, which is $2,545,635 below what should have been made under the annual rate of $1,500,000. In the opening arguments for the company it was declared that the $500,000 had been saved by economy and efficiency in operation, but this saving had been eaten up by other circumstances. The saving was made, it was declared, but the company cannot control the riding habits of the public and the demands for extra service.

Non-Parking Rule Helpful

Traffic Is Speeded Up in Downtown St. Louis by Enforcement of Recent Ordinance

Marked improvement in traffic conditions in downtown St. Louis has resulted from the strict enforcement by the police of a city ordinance abolishing the parking of automobiles and other vehicles on Olive Street between Third and Twelfth Boulevard.

So successfully has the new plan worked out that the Traffic Council, which has been placed in control of vehicular traffic in the city through the recently enacted traffic code, has decided to extend the no-parking rule to Washington Avenue. Parking will be abolished on Washington Avenue from Fourth Street to Eighteenth Street during the morning and evening rush periods. This will provide a free line of traffic by which the morning and evening peak can flow freely into and out of the congested district.

The maximum time now required for a street car to make the trip from Twelfth Boulevard and Olive Street east to Fourth, north to Locust, west to Broadway, south to Olive and thence west to Twelfth Boulevard is ten minutes less than before the new law went into effect. The clocking was done on April 7 and April 9, during the peak of the rush hours. A survey made by the research department of the United Railways on Oct. 23, 1923, showed that this trip required a maximum of thirty-three minutes. The recent survey showed a maximum of twenty-three minutes.

EXTENSION OF PLAN PROPOSED

The elimination of parking on Washington Avenue is expected to be even more beneficial. That street is the gateway for East St. Louis and other East Side cities into St. Louis and is used by the four bus lines now operating in St. Louis, the Page, Park and Compton divisions of the United Railways and hundreds of service cars. With cars parked along the curb this throws most of the heavy traffic onto the railway tracks and street cars and buses lose most of their time in the territory east of Eighteenth Street.

Experts for the United Railways have found that motorists now use Olive Street for a speedy exit from the congested districts. Instead of trailing the street cars and running continuously on the tracks, these machines are able to pass between the tracks and the curb. On other streets where parking is permitted from ten to twelve machines line up in back of every street car and very frequently a street car or bus loaded and ready to go is held up by a minor mishap to an auto.

Elimination of parking on crosstown streets will greatly speed up traffic on both Washington and Olive Streets, experts of the railway say. The survey conducted by the railway in October, 1923, and circulated under the title "Rush-Hour Car Movement in the Congested District" is regarded as having played an important part in the action of the Traffic Council in forbidding parking on Olive Street and the decision to curb parking on Washington Avenue.

East Boston Tunnel Changed Over to Train Operation

By joining forces with the Boston Transit Commission, so as to muster a working crew of about 800 men, the Boston Elevated Railway changed over the service in the East Boston Tunnel between 8 o'clock on the evening of April 18 and 5 o'clock on the morning of April 21 from surface cars to the operation of four-car trains. It was a stupendous job. The tunnel was closed to the public during the fifty-seven hours. Then the crossovers were broken, the guard rails taken down, the third rail installed for a distance of 2 miles and platforms erected at the several stations. This was work which could not be done until the surface cars ceased running. Its completion was accomplished in record time, however, as everything was ready for the work the minute the cars were out of the tunnel. All the platforms had been built in small sections which fitted together like a picture puzzle. The third rail had been welded together in lengths of 400 ft., all ready to set in place.

Forty new steel cars have been purchased by the Elevated for this service, the trains to run between Maverick Square in East Boston and Bowdoin Square in Boston, meeting surface cars at both ends. The new work cost about $2,500,000. It makes the total cost of the East Boston Tunnel approximately $9,000,000. The Elevated pays the rental on this sum to the city of Boston.

Question of Confiscation Involved in Florida Suit

The United States Supreme Court granted a writ of certoriari on April 21 by which it will review the decision of the Florida State Supreme Court in a suit brought by the city of Palatka against the Southern Utilities Company. The company had a franchise secured from the city in 1914. Owing to the increase in costs due to the war, the company later gave notice of an increase in rates of gas. The city sought an injunction on the ground that the rate named in the franchise was a contract obligation. The city was sustained by the trial court and by the State Supreme Court. The company alleges that the rate is confiscatory and that there is no rate-making power delegated by the Legislature of Florida to the municipality.

Puget Sound Property and City of Seattle Must Pay Taxes

Under a ruling of the United States Supreme Court, the city of Seattle and the Puget Sound Power & Light Company will be compelled to pay taxes totaling $401,000, on railway property for the period from September, 1918, to March, 1919. The case was the outcome of the railway purchase by the city, which was contracted in the fall of 1918, but was not consummated until March, 1919. Under the contract, the city was to pay three-fourths and the company one-fourth of the taxes due for this period. When the company started suit to prevent collection of its one-fourth the city joined. The city contended that if the company were to be exempted from the county taxes, the city should also be exempted. The Supreme Court of the United States, in refusing to grant a rehearing of the case, upheld the Supreme Court of the State of Washington.

Will Investigate Cincinnati Property's Books

Carl H. Nau, head of the firm of Nau, Rusk & Swearingen, certified public accountants of Cleveland, Ohio, was sworn in as Master Commissioner to examine the books, papers and records of the Cincinnati Traction Company by Judge Robert S. Marx, in the Hamilton County Superior Court on April 7. Appointment of the master commissioner is the result of a suit filed by Attorney Robert Alcorn, as a taxpayer, against the traction company to compel the payment of franchise tax deficiencies amounting to $1,050,000. Hearing of the suit started on April 1. Judge Marx decided to have an expert accountant go over the traction company's books and obtain data desired, so as to get at the bottom of the case. Attorney Alcorn objected to the procedure. W. Kesley Schoepf, president of the traction company, then offered to provide $5,000 out of his own pocket to finance the accounting of Mr. Nau.

The hearing on the matter has been postponed until Mr. Nau completes his investigation.

In defining the details of the work of the investigators the court assumed the validity of the service-at-cost franchise under which the traction company is now operating.

City to Co-operate with P. R. T. on Refund

Approval has been given by the committee on transportation and public utilities of the City Council of Philadelphia to an ordinance authorizing the city to join with the Philadelphia Rapid Transit Company in an effort to secure a $5,000,000 income and excess profits tax refund from the government. Provision is also made in the measure that the money refunded or saved through an exemption of the company from similar taxes in the future shall be used only for additions, extensions and betterments of the city's street railway transportation. The railway's appeal for a refund was turned down.

Forty-four per Cent in Wages.—The Philadelphia Rapid Transit Company's employees received in wages 44 per cent of the fares collected in 1923. In *Service Talks*, the official publication of the company, the story of what happened to each 6¼-cent fare last year is shown in graphic form. Four per cent provided the dividend on the $30,000,000 of paid-in capital. Twenty-four per cent was used to pay other operating expenses, including cost of power and maintaining equipment, with 22 per cent paying interest on bonds and rentals. This left 6 per cent going to the city, state and federal governments in taxes.

Municipal Ownership Advocated

A recommendation that the city of St. Louis pass a bond issue of $51,000,000 for the purchase of the United Railways was made by L. R. Bowen, chief engineer of the division of bridges and buildings, Department of the President, Board of Public Service, in an exhaustive report submitted on April 18 to E. R. Kinsey, president of the board.

Mr. Bowen details a plan whereby he contends the city can take over the railway and provide for needed extensions without additional cost to the citizens and with no increase in the present fare of 7 cents with universal transfer. He states that the trend is toward municipal ownership, pointing out that of all the cities that have embarked upon this venture none had the opportunity of taking over a transportation system under the auspicious circumstances St. Louis enjoys.

The presentation of the report caused quite a stir in administration circles. Mayor Kiel and Mr. Kinsey disclaimed the report. The Mayor expressed surprise that Mr. Bowen had submitted the report, stating that the first he knew of it was when he read a synopsis of the report in a St. Louis morning newspaper. Mr. Kinsey, too, declared that he was unaware that Mr. Bowen was to submit a report on his studies of transportation methods in other American cities, and that he certainly did not order it or authorize such a report to be made.

CITY'S EXPERT DISAGREES

Rolla Wells, receiver of the United Railways, declared that the price of $51,000,000 would wipe out the holders of the common and preferred stock in the company. Mr. Wells said:

> I ran for Mayor of St. Louis years ago on an anti-municipal ownership platform. I was opposed to public ownership then, and I have no reason to change my stand now. Mr. Bowen's proposal goes back directly to the utility of municipal ownership. As receiver for the United Railways, I am not in a position to comment directly on the report. I have no authority to sell the property, being simply its custodian for the federal court.

Mr. Watts, chairman of the reorganization committee, pointed out that the $51,000,000 valuation was merely set for rate-making purposes, and that that valuation had no relation to the price which the buyers might pay for it.

C. E. Smith, the city's expert on public utility matters, said that while he was in accord with the principal of municipal control of public utilities he was not ready to say that this could best be accomplished by municipal ownership. He said that St. Louis is not in the same relative position as Detroit to force a low purchase price. In St. Louis the company's principal franchises do not expire until 1929. Other rights do not expire until 1942 and still others not until 1948. Mr. Smith said that after studying the experiences of American cities with their street railways, he was convinced that better results could be obtained through municipal control such as is exercised by the city of Cleveland under private ownership and municipal supervision than under municipal ownership and operation.

Wage Demands in Pittsburgh Cannot Be Met

The demands of the 3,200 trainmen of the Pittsburgh Railways, Pittsburgh, Pa., cannot be met at the present time, A. W. Thompson, president of the Philadelphia Company, announced in a letter to President Winters of the City Council, without creating a deficit in the revenues of the company. He stated that the increased wages would create a loss which would have to be offset by increased fares. He invited suggestions from the Council on the matter of the increased wage demand.

In a memorandum accompanying the letter and signed by Thomas Fitzgerald, general manager of the railway, it was brought out that all available income was necessary now to meet operating expenses of the system. Mr. Fitzgerald also reported that the meeting on April 21 with the men was largely a repetition of former meetings. He said that no new arguments were being presented by either side.

The conductors and motormen have asked for an increase from 68 cents an hour to 75 and 77 cents for the first and second years respectively. The present wage scale expires May 1.

Buffalo Company Wins First Damage Suit in Dynamite Case

The International Railway, Buffalo, N. Y., has won the first suit brought against it for damages as the result of injuries alleged to have been sustained by a passenger on the Buffalo-Niagara Falls high-speed line interurban train which was wrecked at Ellwood Station in August, 1922, by dynamite claimed to have been placed by strikers. The suit was the first of a series of such actions for $40,000 damages. The case was heard in the United States Court for the Western District of New York. The jury was out two hours and returned a verdict of no cause of action. Counsel for the International argued the company was not responsible for injuries sustained by Mrs. Anna Hanna, Philadelphia, one of the wreck victims. He suggested that the suit should be brought against the Buffalo local of the Amalgamated Association, members of which, he charged, dynamited the track and caused the wreck. The company introduced testimony to show that everything possible was done by the company to protect its passengers.

Texas Interurban Planning to Build

With the completion of organization of the Texas Rapid Transit Company, announcement is made that the construction of an electric interurban line linking Austin and San Antonio, Tex., is assured. The line as contemplated would pass through the towns of Lockhart, Seguin, San Marcos, New Braunfels, Gonzales, Cuero and Yoakum.

The company has taken over all rights held by the Seguin & Guadalupe Valley Railway, organized in 1914, before the World War, by W. B. Dunlap, Beaumont, and Dr. E. W. Brown, Orange. This company has secured much of the right-of-way for its proposed line between San Antonio and Seguin and grading had commenced when operations were halted by the war. The first unit of the proposed Austin-San Antonio electric line will be built between San Antonio and Seguin.

The proposed electric line will be approximately 100 miles long. It is estimated that its completion will require an investment of more than $7,500,000. E. G. Potter, San Antonio, is president of the company.

Settlement of Los Angeles Damage Suit Shown

When the case of Mrs. Julia H. J. Henderson against one of the local Los Angeles railways, was called for argument recently in Judge Fleming's court it was stricken from the calendar. This indicates that a settlement has been effected out of court. The case was considered an important one from a legal standpoint, as it involved the question of whether a traction company can be held liable for damages by permitting more passengers to enter a car than can be accommodated with seats.

Mrs. Henderson sued the railway for $10,150 damages for injuries she asserted she received June 9, 1923, when a car in which she was a passenger, lurched suddenly, hurling her against a rear section. She contended the company was negligent in permitting the car to become overcrowded and with failing properly to provide passengers with seats. In an answer to the suit, the company stated that if the plaintiff became a passenger when the car was overcrowded she did so voluntarily and therefore assumed the risk of possible injury with her own knowledge. The defendant contended that probable injury was to be anticipated at the time Mrs. Henderson boarded the car.

Arkansas City Councils Pass Ordinances

The City Councils of Little Rock and North Little Rock, Ark., have passed the ordinances necessary to permit the Inter-City Terminal Railway of North Little Rock to cross the new Main Street bridge connecting the two cities. Under the plan agreed to the company will charge a 6-cent fare for the privilege of crossing the bridge from any part of either city, but should a passenger desire to proceed beyond the bridge line he must pay an additional 2-cent fare for a transfer.

Officials of the Inter-City company have announced their intention of speeding up the laying of the double track on the bridge so that the service can be put into effect about May 1. The company, which has been granted a twenty-six year franchise for the use of the bridge, will pay Little Rock $25,000 cash and $35,000 in partial payments and also will receive credit for $40,000 for laying the new tracks for the new franchise. The franchise ordinance provides that future interurban lines shall be permitted to use the new bridge on equitable terms, and in the event the railways cannot agree on that point the city shall decide it.

Terminal Plan in Trenton Abandoned

The plan to build a large central terminal in the heart of Trenton, N. J., for the suburban lines of the Trenton & Mercer County Traction Corporation, New Jersey & Pennsylvania Traction Company and the Public Service Railway has been abandoned. The three companies announced that the costs would be prohibitive. The site selected for the proposed terminal has been purchased by the Trenton & Mercer County Traction Corporation and a terminal for that company alone will be built.

The idea of creating such terminal was conceived by Mayor Donnelly of Trenton, and indorsed by the other members of the commission. The plan contemplated by Mayor Donnelly provided for the acquisition of all property along the north side of Perry Street, between North Broad and North Warren Streets, and to whatever depth might be required for the purposes in view. Preliminary surveys made by City Engineer Swan indicated that this location would be well suited to the proposed establishment of a terminal. Fulfillment of the project, it developed, would cost in the neighborhood of $1,500,000 and none of the companies, it was understood some time ago, would agree to enter upon such expensive undertaking.

Free Transportation a Menace in New Orleans

At the request of Commissioner Paul H. Maloney, of the Department of Public Utilities at New Orleans, President Flowers of the New Orleans Public Service, Inc., has sent the commissioner a list of the free trippers for the month of February. The list shows that the holders were given 167,646 rides during the month. At 7½ cents a ride this represents $11,735 for the month. This is a decrease of 2,680 rides from the number of passes issued in January.

Accompanying the list was a communication from Mr. Flowers in which he outlined the policy of the company in regard to granting free transportation to employees of the Public Service, Inc., stating additionally that it is the usual rule of practice with all companies regarding whose practice he has knowledge to give its employees unlimited passes, while New Orleans occupies a unique position in this that the practice is curtailed. He said:

> We give transportation to those of our employees who are required to ride on the cars, or to make visits in the interest of the development of our business. In addition, the contract with the union requires free transportation to employees in uniform and also to all other members covered by the contract. Policemen, firemen, and female members of religious orders in their garb ride without passes.

Mr. Maloney regards every free ride as a factor in preventing the lowering of fare. He has announced his intention of having an auditor check the books of the company for the purpose of determining whether the railway division of the company is being credited with service furnished the other departments.

Eighty Cents Sought in Detroit

Although the new wage demands adopted April 19 by the motormen and conductors on the Detroit Department of Street Railways have not yet been officially presented to the Street Railway Commission, platform men, according to Herbert Meeker, president of Division No. 26, are asking a wage for two-men car operators of 72 cents an hour for men in their first six months of service, instead of 62 cents as at present; 76 cents an hour for men in their second six months of service, instead of 66 cents, and 80 cents an hour instead of 70 cents after one year of service. For overtime (more than eight hours) time-and-a-half is asked, instead of 75 cents an hour now given; for owl cars the request is 90 cents, instead of the 80 cents now prevailing, and for crews placed in charge of snow plows $1 an hour.

The union also asks that 25 per cent of the runs be straight day runs, 25 per cent straight night runs, 30 per cent of the runs to be completed in eleven consecutive hours, while the remaining 20 per cent must be completed in twelve and one-half consecutive hours. A shift of more than six hours would be considered a full day under the new plan.

Operating expenses of the system would be increased $1,025,000 for the year if the increase asked were granted. This would wipe out the estimated net earnings of $960,000 for the year and probably make it necessary to abandon the program of rehabilitation or increase fares.

In case the formal demands of the men are not met, arbitration will probably be asked of the Street Railway Commission. The city has never recognized a union among its employees on the ground that the charter forbids it.

Washington Railway Men Get Two Cents Increase

At a meeting of the directors on April 19 it was decided to increase the pay of the motormen and conductors of the Washington Railway & Electric Company, Washington, D. C., 2 cents an hour, following a similar increase to Capital Traction employees, which was referred to in the ELECTRIC RAILWAY JOURNAL, issue of April 19. The new scale is 52 cents for the first three months, 56 cents for the next nine months and 58 cents thereafter. Operators of one-man cars will receive 63 cents an hour. In making the increase, the Washington Railway & Electric Company announced that it would abandon the quarterly cash prizes heretofore awarded for safety-first work.

Ordinance Introduced for P. R. T. Bus Line

An ordinance granting the Philadelphia Rural Transit Company, a subsidiary of the Philadelphia Rapid Transit Company, a franchise for operating a motorbus line between Mount Airy Avenue and Germantown Avenue was introduced recently in Council by Councilman Smith and was referred to the committee on transportation and public utilities.

The ordinance provides that the franchise shall not be regarded as an exclusive privilege that would prevent the city any time hereafter operating buses of its own on any of the streets. The fare, subject to the approval of the Public Service Commission, is 10 cents for a one-way trip, with the 3-cent exchange tickets to surface or elevated connecting lines of the P. R. T. Another provision is that the earnings of the Philadelphia Rural Transit Company accruing directly or indirectly to the P. R. T. shall be applicable to the payment to be made to the city under the provisions for the retaking of profits contained in the agreement of 1907.

Oklahoma Union Authorized to Charge Higher Fare

The Oklahoma Union Railway has been authorized by the Corporation Commission to put into effect the same rates of fare that are now effective over the lines of the Tulsa Street Railway between all points in Tulsa and West Tulsa within the city limits. The company has been operating for several years on a 5-cent fare within the city limits and contended that it had been losing money on this fare basis since 1919. On Jan. 15, 1924, it filed an application with the commission seeking an increase in its city fare from 5 cents to 7 cents, or four tickets for 25 cents, the latter rate being the charge that the Tulsa Street Railway had been receiving for city passenger fares. The Corporation Commission finds that for the year ended Dec. 31, 1923, the net revenue of the Oklahoma Union Railway for both city and interurban fares was $17,481. Further, that this amount was not sufficient to pay the interest on outstanding bonds of the company.

The Oklahoma Union Railway is primarily an interurban railway. It also operates about 4 miles of line in Tulsa and handles approximately 1,500,000 passengers a year in that city. The commission also approved an agreement between the Oklahoma Union Railway and the Tulsa Street Railway for transfer exchange at specified points.

Twenty per Cent Increase Asked in Toledo

In a new contract submitted to the officials of the Community Traction Company, Toledo, the employees have asked for a 20 per cent wage increase and changes in working conditions estimated to cost the company an additional $400,000 annually. The men now receive 50, 52 and 55 cents an hour. They demand 60, 63 and 65 cents an hour. The present contract will expire on May 21.

In addition to the direct wage boost the men want two weeks' vacation with pay, closed shop on the entire property, and many changes in working conditions.

Company officials have intimated that they will submit the demands to Street Railway Commissioner Cann and the city officials before they undertake negotiations which might lead to a drastic increase in fares.

Last year's wage increase cost $15,000 a month and resulted eventually in a fare increase.

Fares Advanced in Indianapolis

Seven-cent cash fares with four tickets for 25 cents, double transfers and a 1-cent transfer charge will become effective on the lines of the Indianapolis Street Railway, Indianapolis, Ind., on May 20, under an order issued by the Indiana Public Service Commission on April 18. The company is ordered to extend its service to Broad Ripple by Sept. 1, this year, under penalty of having the increased fare revoked if it does not make the extension by that time. Ten-cent owl fares remain as at present. The commission did not grant the request of Indianapolis city officials for seventeen tickets for $1. The order declares rerouting of the lines is essential both to the railway and its patrons. A decision on new routes is deferred for a supplemental order after the commission obtains suggestions from city officials and other sources. Nothing in the order indicates the period for which it will be enforced.

The present rate in Indianapolis is 5 cents with a 2-cent transfer charge. It was the contention of the company that this rate could not provide sufficient revenue to enable it to rebuild its property. The matter of the need for an increase in the fare of the company has been under discussion for three months under a renewed plea asking relief.

Trial with Reduced Fare in Hornell

Raymond E. Page, new receiver of the Hornell Traction Company, Hornell, N. Y., has asked the Public Service Commission for authority to permit a trial of reduced fares for a period of ninety days. The company is said to have considered the advisability of abandoning operations, but hopes that a reduced rate will stimulate travel and increase revenues. The filing of the formal application with the commission is really a step in the previously announced program to cut rates.

Traffic on the Hornell line has been decreasing. Robert W. Bull, former receiver, resigned on April 3, 1924, and Mr. Page was appointed to succeed him. Mr. Page said:

> I have taken the office of receiver for the purpose of revising the plan of operations, lowering expenses and reducing fares in an effort to continue operations. I believe a reduction of fares will increase the traffic. My desire is to make the effort and ascertain the results. It is of great importance that this be done at once, as delay is injurious in the present situation and the financial condition of the company.

The railroad now operates in two zones with an 8-cent fare in each. A 7-cent fare is to be substituted for the ninety-day trial.

Twenty metal tickets for $1 will be sold by conductors and ten metal tickets for 50 cents at certain places in Hornell and Canisteo. A twenty-ticket book will be sold for $1.40 good in either direction between Hornell and Cook's Switch and between Canisteo and Crittenden. These tickets are good only on Canisteo cars except from passengers boarding local cars at the Erie shops or other industrial establishments and transferring to Canisteo. No commutation tickets will be sold. Transfers will be issued in zone 1.

News Notes

Seeks Dissolution of Bus Line.—The Washington-Virginia Railway has filed with the State Corporation Commission a petition asking that the certificate of the Alexandria Motor Bus Line, Inc., be revoked. It is claimed by the railway that continued competition of the bus line will make it impossible for the railway to render profitable service.

Difficulties in Wichita.—In order to operate the Wichita Railroad & Light Company, Wichita, Kan., profitably fares will have to be increased or competing buses eliminated. This opinion was recently expressed by A. M. Patten, general manager of the property, before members of the City Commission. He said that net earnings for 1923 showed a marked decrease compared with previous years.

Course for Electric Metermen.—The University of Colorado, Boulder, Col., during the week of March 17 to 22, held its Second Annual Metermen's Short Course. This course is given through the extension division and is in direct charge of Professor C. M. McCormick of the electrical engineering department, who also has charge of the electrical standardizing laboratory. The course was not given for electric railway motormen, as was stated in the ELECTRIC RAILWAY JOURNAL, issue of March 29, but for electric metermen of public utilities and others who wished to attend.

Wages Advanced.—The Morris County Traction Company, Morristown, N. J., has granted a wage increase of 5 cents an hour to all the platform men. The company is now operating all cars with one operator. None of the employees has been laid off. As passengers enter the car the operator hands them identification tickets, which indicate the zone in which passengers boarded the trolley.

Offers Old Car Bodies for Sale.—The Brooklyn-Manhattan Transit Company, Brooklyn, N. Y., is offering for sale to its employees the bodies of single-truck cars that have been withdrawn from service on the surface lines. The bodies may be purchased by employees for $25 each and will be delivered to the purchasers at any of the B. M. T. surface line depots or terminals. The bodies can be converted into livable bungalows or camping quarters.

Expropriation Methods to Get Property.—Ninety-three pieces of property involved in the North Rampart-St. Claude Street cut-off of the New Orleans Public Service, Inc., from Esplanade Street, recommended to be acquired in the Beeler traffic report, will be effected by an ordinance adopted by the Commission Council. The city of New Orleans and the company are jointly to bear the expense of obtaining these sites, to carry out the Beeler recommendations. The Commission Council found, after many efforts were made to reach an amicable settlement of the matter, that expropriation methods would have to be used to compel the realty owners to be more reasonable in their demands. The new route will provide a wide thoroughfare from the upper to the lower section of the city.

Disposes of Jamestown Buses.—The Jamestown Street Railway, Jamestown, N. Y., recently announced that the company was selling six of its thirteen buses to Case & Kane, Middletown, N. Y. Five buses will be kept for use on the west side line in Jamestown and two more will be disposed of at once. A. N. Broadhead, president of the railway, recently withdrew an application for a blanket bus franchise in Jamestown after the City Council and railway officials had failed to agree on a rate of fare for the buses or an adjusted flat rate for both trolleys and buses.

Freight Line to Be Electrified.—The Long Island Railroad improvement plans, referred to in the ELECTRIC RAILWAY JOURNAL, issue of April 5, include the electrification of the freight line from Bay Ridge, Brooklyn, to Fresh Pond, where connection is made with the New York Connecting (Hell Gate route) Railroad. Over this route standard freight cars are interchanged daily between the Pennsylvania and New Haven Railroads. At present steam locomotives handle this traffic.

Fare Tariffs Suspended.—The Public Service Commission, in an order recently issued, suspended the proposed new tariffs filed by the Southern Pacific Railway for its Salem and Eugene railway lines, providing for an increase in fares from 6 to 7 cents. The suspension order will remain in effect until Sept. 22, unless investigations of the proposed tariff are completed before that time. Under the tariff filed by the Salem property conductors would be allowed to sell strips of four tickets for 25 cents and tickets in books of fifty could be purchased at $3.10. The present price of the fifty-ticket book is $3. The proposed Eugene schedule is practically the same as that of Salem.

Maine Road Asks Fare Increase.—The Androscoggin Electric Company Lewiston, Me., has filed a petition with the Public Utilities Commission asking for an increase in its through rate of fare from Portland to Lewiston from 93 cents to $1. The petition asks that the new rate become effective May 14.

Advertisements to Tell the Public.—In furtherance of its plan to solve the traffic problem in the downtown sections of Milwaukee and to awaken public opinion to the need of maintaining open spaces for the loading and unloading of buses in each block of the congested district, the Milwaukee Electric Railway & Light Company and subsidiary, the Wisconsin Motor Bus Lines, are running a series of advertisements in the current Milwaukee daily papers. One advertisement, called "Test of Special Bus Loading Zones Is Working Well," promised a report on various experiments which are being tried out in many cities to bring about traffic relief. Another advertisement described what was being done by traffic experts and other city planners in helping to solve the problem at least cost to the taxpayers. A third advertisement described the parking rules in effect in St. Louis, Detroit and San Francisco and another told what the Milwaukee Safety Commission was doing in this matter for the benefit of all concerned. Incidentally, another purpose of the ads. is to help the movement looking toward procuring a solution of the parking problem.

Complains of Bus Grants.—The Cincinnati Traction Company, Cincinnati, Ohio, has appealed to the State Public Utilities Commission for relief from bus competition in its territory. It filed protests against the granting of certificates to the Valley Bus Company and the Anderson's Ferry Transit Line. Petitions also were filed asking for a rehearing of the cases in which the commission granted certificates to the Red Star Transportation Line and the Wilmington & Norwood Bus Company. Protests also were filed against the granting of the certificates on a rehearing. The traction company contends that it is furnishing adequate service over much of the territory covered or proposed to be covered by the bus companies and that the operation of buses would be detrimental to its service.

Will Provide Bus Service.—The Wisconsin Traction, Light, Heat & Power Company, Appleton, Wis., has obtained an option on the bus line operated by Krautkramer Brothers between Appleton and Kaukauna, paralleling the interurban line. The company plans to extend its bus service from Kaukauna to Sheboygan, connecting with the parlor car electric trains of the Milwaukee Northern Railway running to Milwaukee.

Wants to Increase Rates. — The Waterville, Fairfield & Oakland Railway, Waterville, Me., has petitioned the Public Utilities Commission to increase its zone fare from 7 to 8 cents, with an increase in its strip ticket fare from 70 cents to 80 cents and an increase in its commutation books of fifty coupons from $3.50 to $4. The rate of pupil's tickets in books of forty coupons is increased from $1.40 to $1.60. The proposed schedule would become effective May 12. An increase in the zone fare on this line from 5 to 7 cents was granted by the Public Utilities Commission in the fall of 1918.

Seeks Permission to Increase Fares.—The Honolulu Rapid Transit Company, Honolulu, Hawaii, has petitioned the Territorial Public Utilities Commission for permission to increase fares in Honolulu from 5 cents to 6¼ cents, or four tokens for 25 cents. The report of operations of the company for 1923 was reviewed in the issue of the ELECTRIC RAILWAY JOURNAL for April 19, page 636.

Bus Permitted Provisionally.—The Public Service Commission recently granted a permit to operate buses between Tonawanda and the plant of the Dunlop Tire & Rubber Co., Inc., but provision is made for the cancellation of the franchise in the event that the International Railway, Buffalo, extends its River Road line to serve the Dunlop plant. Mr. Wooley had two buses in operation on River Road in 1920 until he was stopped by the commission after the International secured an injunction restraining him from further operation of the route in competition with its railway.

Financial and Corporate

Delaware & Hudson Reports

Electric Lines Under the Albany System Show Both Increase and Decrease in Operating Revenues

The report of the Delaware & Hudson Company, Albany, N. Y., for the year ended Dec. 31, 1923, contains summaries of the earnings of the company's allied electric railway lines, including the United Traction Company, Hudson Valley Railway, Plattsburgh Traction Company and the Troy & New England Railway.

Details of Albany Operation

Operating revenues of the United Traction Company from all sources during 1923 were $3,234,149, operating expenses $2,839,937 and taxes $244,500. Operating income was $149,712, compared with $273,366 in 1922, a decrease of $123,654. Operating revenues increased $148,858, or 5 per cent over the preceding year; operating expenses increased $261,712, or 10 per cent, and taxes increased $10,800, or 5 per cent.

Of the gain in operating revenues, $75,521 was principally due to an increase of 1,033,000 in passengers carried and $74,894 to power sold to other companies. Operating revenues would have been greater except for losses of approximately $51,000 from the strike on the Schenectady Railway and $10,000 from a strike of short duration, in June, 1923, on the lines of the company.

Among the increases in items of operating expenses are: Paving, $102,500; removal of snow and ice, $24,000; equipment retired, $74,146; power purchased, $102,500; increased wages, effective June 1, 1923, $84,000; injuries and damages, $33,000, and these are partly offset by the following decreases: Track and roadway labor, $23,000; track and roadway material, $18,000; maintenance of structures, $21,000; miscellaneous equipment expenses, $5,000; maintenance of plant, buildings and equipment, $13,000; power plant supplies, $5,000; superintendence of transportation, $4,500; miscellaneous transportation expenses, $40,000; general office expenses, $26,000.

Paving Proves Expensive

Extensive street paving programs of the municipalities in which the electric railway lines are located forced premature reconstruction of tracks by the company at a cost of $347,208, involving charges to operating expenses of $134,694. The company's proportion of the cost of new pavement laid in 1923 approximated $204,578, of which $50,203 was charged to operating expenses and the balance to capital account. More than $1,000,000 has been spent in paving and repairing Capitol District streets and highways within the last ten years. The company regards the paving charges as needlessly burdensome.

Operating revenues of the Hudson Valley Railway during 1923 were $961,108, operating expenses $878,282, and taxes $67,000. Operating income for the year was $15,826, compared with $82,339 in 1922, a decrease of $66,513. Operating revenues decreased $62,511, or 6 per cent from the preceding year; operating expenses decreased $3,877, or less than 1 per cent, and taxes increased $7,879, or 13 per cent. Extensive use of privately owned automobiles is assigned as the principal factor in the decrease in operating revenues. One-man car operation was established on all lines in Glens Falls and on the interurban lines between Glens Falls, Hudson Falls and Fort Edward. In 1923 the municipality of Glens Falls engaged in a street paving program. The cost of its part of this work to the company was $41,515, of which $6,650 was charged to operating expenses and $34,865 to capital.

Operating revenues of the Plattsburgh Traction Company were $33,244, operating expenses $31,039, and taxes $2,107. Operating income for the year was $98, compared with $1,492 in 1922, a decrease of $1,394. Operating revenues decreased $2,728, or 8 per cent from the preceding year; operating expenses decreased $1,595, or 5 per cent, and taxes went up $262, or 14 per cent.

Operating revenues of the Troy & New England Railway were $30,073, operating expenses $20,990 and taxes $2,001. Operating income for the year was $7,082, compared with $534 in 1922, an increase of $6,548. Operating revenues increased $4,848, or 19 per cent over the preceding year; operating expenses decreased $2,113, or 9 per cent, and taxes increased $412, or 26 per cent.

$3,000,000 Equipment Issue at Pittsburgh

A total of $3,000,000 of Pittsburgh Railways 6 per cent car trust gold bonds was offered for subscription on April 24 by the Union Trust Company, Pittsburgh. The bonds mature serially, $200,000 on Feb. 1, 1925; $200,000 on Feb. 1, 1926, and $200,000 Feb. 1, 1927 to 1939, inclusive, the offering prices being respectively 100.50 yielding 5.22 per cent, 100.75 yielding about 5.50 per cent and 100 yielding 6 per cent.

It is explained that the car trust bonds are to be issued in part payment for sixty single-end, center-entrance, semi-convertible, double-truck, semi-steel passenger cars; 160 semi-steel passenger cars of the multiple-unit type, and sixty-five semi-steel passenger cars of the one-man, two-man type. The cost of this new equipment is estimated at $3,600,000.

The statement of the offering house reviews the new operating agreement with the city and says that this arrangement practically assures adequate revenues. The balance after the payment of fixed charges, including rents of leased properties, is reported at $670,276 for 1921, $555,509 for 1922 and $1,128,750 for 1923.

$3,200,000 Grand Rapids Issue Offered at 7 per Cent Yield

Dillon, Read & Company, Federal Securities Corporation and Spencer Trask & Company, New York, offered for subscription on April 23 $3,200,000 of first mortgage 7 per cent sinking fund gold bonds dated May 1, 1924, and due May 1, 1939. The price was 99½ and interest, to yield slightly more than 7 per cent. The bonds are in the denomination of $1,000 and $500. The proceeds of the sale of the bonds are to be used in refunding bonded debt of the company due June 1, 1924.

The Grand Rapids Railway owns and operates the entire electric railway system in the city of Grand Rapids, serving a population of more than 145,000. It is explained that the bonds are to be secured by a direct first mortgage lien on 69 miles of railway and 193 cars now owned by the company, and on all its tracks, equipment, real estate and other physical property, together with power contracts and franchises.

The bankers point out that the City Commission of Grand Rapids has placed a valuation of $5,500,000 on the properties for purposes of rate making, as of Jan. 1, 1922, and that with additions to property since that date, the rate making base now amounts to more than $5,800,000. Net income after taxes, available for interest and depreciation reserves for the year ended Dec. 31, 1923, was $560,457. This amount is two-and-a-half times the annual interest charge of $224,000 on the $3,200,000 new first mortgage 7 per cent bonds. A sinking fund of 2½ per cent per annum payable semi-annually will be used to retire bonds by purchase up to the current redemption prices or, if not so obtainable, by call at those prices.

The gross earnings of the company in 1916 were $1,297,586. That year bond interest was $143,012. In 1923 the gross earnings were $1,817,606. That year bond interest was $220,000. The net earnings available for interest and depreciation increased from $469,561 in 1916 to $560,457 in 1923.

Approves Security Issues in Birmingham Reorganization

Transfer of all properties of the Birmingham Railway, Light & Power Company, Birmingham, Ala., and of the Tidewater line to the newly organized Birmingham Electric Company was approved by the Alabama Public Service Commission and formal orders were issued following a hearing in Montgomery on April 16. Authority was also granted to the Birmingham Electric Company to issue $8,000,000 of refunding mortgage gold bonds bearing 6 per cent interest and maturing in 1954, 19,990 shares of no par value cumulative preferred stock and 799,990 shares of no par value common stock.

The railway properties to be transferred include the Norwood Street Railway and the Edgewood Street Railway, in addition to the Birmingham Railway, Light & Power and Tidewater lines. The petitions were amended at the hearing to include the Tidewater lines and the other properties.

Initial Dividend on B.-M.T. Preferred Stock

The directors of the Brooklyn-Manhattan Transit Corporation on April 21 declared an initial dividend of $1.50 a share on preferred stock for the quarter ended March 31, 1924, payable on May 15 to stockholders of record on May 1. The dividends on this stock do not become cumulative until July 1, 1926.

Gerhard M. Dahl, chairman of the executive committee, says that this dividend is to be considered in the nature of interest on money contributed by stockholders at the time of the reorganization, nine months ago, and is not to be taken as an indication that the company is earning a fair return on its actual investment or on a fair valuation of its property.

Mr. Dahl declared that the city by reason of its failure to build subways called for by the dual subway contracts was responsible for the present overcrowding of the rapid transit lines and had handicapped the company seriously. He asserted that the city had also defaulted in its obligation to supply the company with yards and shops and added that it was the policy of the present management of the company to give the best service possible under existing conditions.

Mr. Dahl said in part:

> Before the directors, however, had taken any action in recognition of their obligation to the preferred stockholders, they did everything within their present power to provide adequate transit facilities for the public. Since the organization last June, for example, the directors have appropriated approximately $4,000,000 for new cars and equipment for rapid transit lines alone, despite the fact that the net income from the operation of the rapid transit lines would not justify so large an investment in improvements. Furthermore, on its surface lines this company is continuously making changes and adding improvements which seek to better the service.
>
> The B.-M. T. is ready now, as it has been at all times in the past, to increase its rapid transit service and to decrease the necessity for the present dangerous and unhealthful congestion but it is powerless to do anything more so long as the city of New York defaults under its contract with this company and refuses to carry out contract No. 4, which provides for the completion of the Fourteenth Street eastern line, the Nassau-Broad Street extension and the construction of new shops and yards.
>
> The city and the company together have invested in our rapid transit lines the sum of $295,000,000. On this amount for the first nine months of operations the earnings were 2.4 per cent.
>
> For eleven years taxpayers and investors have combined to pour money into rapid transit lines and equipment, and this huge investment is earning less than 3 per cent without allowing any return on the $60,000,000 worth of elevated lines.

Kansas Lines Participate in Terminal Line Purchase

The Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan., has been authorized to acquire control of the Kansas & Missouri Railway & Terminal Company through the purchase of 8,000 shares of stock without nominal or par value, issued or to be issued by the Terminal company under authority granted by the Interstate Commerce Commission's order of Feb. 16, 1924.

The commission dismissed that part of the application of the Kansas City, Kaw Valley & Western seeking to acquire first mortgage bonds of the Terminal company and the application of the Kansas City Southern to acquire one-half of said bonds, the principal amount of which is $379,000.

The Kaw Valley operates an electric passenger and freight road between Kansas City and Lawrence, Kan., and connects at Kansas City with a line formerly owned by the Kansas City, Outer Belt & Electric Railway, and through an arrangement with the receiver of the Outer Belt Road, the Kaw Valley is able to interchange freight with other carriers, including the Kansas City Southern. The Outer Belt also owns a partly constructed line, extending from a connection with the Kaw Valley to a point near the mouth of the Kansas River, which line the Terminal company was instructed to complete and operate, together with the lines formerly owned by the Outer Belt. The lines of the Terminal company will be operated by electricity, with some of the equipment, power and employees of the Kaw Valley.

The cost of the Terminal company's securities to the Kaw Valley and the Kansas City Southern, which participated in the purchase, is $388,636. The cost of rehabilitation and construction of the Terminal company's lines is placed at $421,000, or a total estimated cost of the lines when completed of $809,636.

Largest Balance for Dividends in Holding Company

Standard Gas & Electric Company, Chicago, reports for 1923 the largest balance available for dividends in the history of the company. The payment of dividends on the common stock at the rate of $2.50 per share per annum was started for the quarter beginning April 1, 1923. Common dividends were increased to the rate of $3 per share per annum for the quarter beginning Jan. 1, 1924.

Net revenue of the company for 1923 was $5,103,425, compared with $4,652,126 in 1922. The company includes in its earnings only amounts actually received or in process of collection. The balance before preferred dividends in 1923 was $2,940,829 compared with $2,811,422 in 1922.

Gross earnings of the operated public utility companies for 1923 were $46,165,533 and net earnings were $18,711,033. These figures represent an increase in gross earnings of 9.72 per cent and an increase in net earnings of 16.4 per cent over 1922.

The interests of the stockholders have been substantially improved, according to President H. M. Byllesby, by certain changes in the capital structure, authorized at a special meeting of the stockholders on March 19, 1924, at which the recommendations of the directors for an authorized issue of 7 per cent cumulative prior preference shares and 6 per cent non-cumulative stock were approved. This action enables changes in the outstanding capitalization which, together with the conversion of debentures into common stock, will result in reducing the proportion of funded debt to the total capitalization. Upon completion of this financing the company will have no secured funded debt.

The construction budgets for 1924 are estimated at $32,672,000, representing additions and extensions. New construction in 1923 required an expenditure of $31,471,106.

The Standard Gas & Electric Company operates the electric railways in Fargo, N. D., and Fort Smith, Ark. During the year it took over the Wisconsin-Minnesota Light & Power Company, operating about 25 miles of city and interurban railway.

Conspectus of Indexes for April, 1924

Compiled for Publication in this Paper by
Albert S. Richey
Electric Railway Engineer
Worcester, Mass.

	Latest	Month Ago	Year Ago	Since War High	Since War Low
Street Railway Fares* 1913 = 4.84	Apr. 1924 **6.94**	Mar. 1924 **6.93**	Apr. 1923 **6.89**	May 1921 **7.24**	May 1923 **6.88**
Street Railway Materials* 1913 = 100	Mar. 1924 **164**	Feb. 1924 **163**	Mar. 1923 **174**	Sept. 1920 **247**	Sept. 1921 **156**
Street Railway Wages* 1913 = 100	Apr. 1924 **219**	Mar. 1924 **219**	Apr. 1923 **207**	Sept. 1920 **232**	Apr. 1923 **207**
Steel—Unfilled Orders (Million Tons) 1913 = 5.91	Mar. 31 1924 **4.78**	Feb. 29 1924 **4.91**	Mar. 31 1923 **7.40**	July 31 1920 **11.12**	Feb. 28 1922 **4.14**
U.S. Bank Clearings Outside N. Y. City (Billions)	Mar. 1924 **15.12**	Feb. 1924 **14.71**	Mar. 1923 **16.36**	Mar. 1920 **18.54**	Feb. 1922 **10.65**
Business Failures	Mar. 1924	Feb. 1924	Mar. 1923	Jan. 1924	Sept. 1923
Number	**1,652**	**1,578**	**1,677**	**2,258**	**1,280**
Liabilities (millions)	**61.33**	**73.75**	**60.62**	**109.1**	**27.50**

	Latest	Month Ago	Year Ago	Since War High	Since War Low
Eng. News-Record Construction costs 1913 = 100	Apr. 1924 **221.6**	Mar. 1924 **221.7**	Apr. 1923 **213.5**	June 1920 **273.8**	Mar. 1922 **162.0**
U.S. Bur. Lab. Stat. Wholesale Commodities 1913 = 100	Mar. 1924 **150**	Feb. 1924 **152**	Mar. 1923 **159**	May 1920 **247**	Jan. 1922 **138**
Bradstreet's Wholesale Commodities 1913 = 9.21	Apr. 1 1924 **12.66**	Mar. 1 1924 **12.90**	Apr. 1 1923 **13.93**	Feb. 1 1920 **20.87**	June 1 1921 **10.62**
Dun's Wholesale Commodities 1913 = 120.9	Apr. 1 1924 **186.8**	Mar. 1 1924 **190.7**	Apr. 1 1923 **193.1**	May 1 1920 **263.3**	July 1 1921 **159.8**
U.S. Bur. Lab. Stat. Retail food 1913 = 100	Mar. 1924 **144**	Feb. 1924 **147**	Mar. 1923 **142**	June 1920 **219**	Mar. 1922 **139**
Nat. Ind. Conf. Bd. Cost of living 1914 = 100	Mar. 1924 **163.2**	Feb. 1924 **163.9**	Mar. 1923 **159.2**	July 1920 **204.5**	Aug. 1922 **154.5**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population.

Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen and conductors on 105 street and interurban railways in the United States, operating more than 100 passenger cars each, and weighted according to number of cars.

Power Rights Acquired.—Thomas S. Wheelwright, president, has announced the purchase by the Virginia Railway & Power Company of the property of the Roanoke Rapids Power Company, Roanoke Rapids, N. C., owner of valuable water rights, some of them undeveloped, north of Weldon, N. C. Instead of adding to its steam power equipment the Virginia Railway & Power Company plans to build a high-tension line connecting with the Virginia cities.

Interurban Involved in Purchase.—An option on the controlling interest in the common stock of the Toledo & Indiana Traction Company, Toledo, has been taken by the Lake Shore Power Company, a new holding corporation, organized here with Charles T. DeHore of the General Electric Company as president and L. V. Van Ness, president of the Maumee Valley Lines, and other local capitalists associated with them. The Toledo & Indiana operates from Toledo west to Bryan, a distance of about 50 miles. It has $1,040,000 of common stock and $400,000 of bonds outstanding. The railway does a power and lighting business.

Net Earrings of Porto Rico Company Lower.—Net earnings of the Porto Rico Railways, Ltd., Ponce, Porto Rico, for 1923 were $433,353, compared with $516,638 for 1922, due to heavier operating expenses. Disbursements included $119,020 interest on first mortgage bonds, $64,483 interest on refunding mortgage bonds, $70,000 dividend on preferred stock, $100,000 reserve for depreciation. Including balance of $557,405 at credit of profit and loss, there was carried forward $651,221. Current assets decreased from $503,081 to $453,627, and current liabilities from $355,625 to $242,183, an improvement of $63,987 in liquid position.

Hearing Set in Reorganization Contest.—Action in a contest to set aside the reorganization of the San Francisco-Oakland Terminal Railways, Oakland, Cal., as the Key System Transit Company, was taken on April 15 when Superior Judge John D. Murphey set April 25 as the date for hearing of several motions and demurrers to the suit brought against the company by Frederick Olschweski. One of the charges is that the committee in charge of the reorganization conspired to wipe out the interest in the company which were represented by the ownership evidenced in the issue of common stock outstanding.

Confirmation of Sale Before Judge.—The sale of the Electric Short Line, which runs westward from Minneapolis, Minn., by the mastery in chancery for $275,000 has been placed before Judge W. F. Booth of the Federal court for confirmation. The line was sold at public auction by Master Howard S. Abbott to the bondholders represented by W. H. Thorp, chairman of the reorganization committee. The line has cost more than $2,000,000 and prospective extensions have not yet been completed. A foreclosure decree was entered in January. Willard J. Hield and Erle D. Luce are receivers for the property. The purpose in reorganization has been to reduce the bonded indebtedness to such a ratio to assets as to make it possible for the Interstate Commerce Commission to give authority for a bond issue to finance extension of the line of the company, to points west of Lake Lillian, the present terminus.

Cannot Delay Tax Payments.—The United States Court of Appeals at St. Louis reaffirmed its former ruling that the Denver Tramway, Denver, Colo., now in receiver's hands, cannot list taxes owed to the city of Denver as "an ordinary debt to take its turn with other debts." The company owes the city $220,000. It ceased paying right after the 1920 strike.

Suburban Railway Discontinued.—In his annual report to the shareholders of the Dominion Power & Transmission Company, Hamilton, Ont., President J. R. Moodie states that with the exception of the railway department a steady advance was enjoyed in 1923. During the year just ended the board decided that it was necessary to discontinue operating the Hamilton & Dundas Railway and on Sept. 5, 1923, this decision became effective. Nothing is known yet as to the disposition of the property. The statement says that bonds to the amount of $231,000 have been redeemed. According to the report the total of the reserves and profit and loss accounts have been increased by the sum of $283,559, bringing this total to the amount of $3,900,021.

Equipment Trust Certificates Offered.—Mention is made in an offering of $17,640,000 of Southern Pacific Company 5 per cent equipment trust certificates, Series G, of the fact that five electric locomotives, fifty steel center-entrance electric street cars, twelve steel one-man, two-man electric street cars, and six steel electric motor coaches are included in the equipment covered by the deed of trust. The offering was made by Kuhn, Loeb & Company, New York, on April 24. The certificates are being offered at 99½ and accrued dividends to yield an average of 5.08 per cent. They mature in equal annual instalments from May 1, 1925 to May 1, 1939 both inclusive. There is vested in the trustee title to equipment costing not less than $22,050,000.

Railway Service to End.—After a controversy of many weeks the Chicago, Burlington & Quincy Railroad, Deadwood, S. D., has given notice that trolley service between Deadwood and Lead will be discontinued and that a bus line will be substituted to operate between the two cities, which are about 4 miles apart. David Keffeler, Lead, S. D., will run the bus line between the two cities for a period of three years, which is the unexpired term of the franchise with the city.

South Carolina Company Reported Under Option.—Stone & Webster, Inc., Boston, are reported to have an option on the Columbia Railway, Gas & Electric Company and associated utility properties in and near Columbia, S. C., with a view to possible purchase of these properties and the development of additional power for central South Carolina. It is further said that a proposition has been made to the Columbia Canal Commission to pay the state $200,000 for settlement of the pending litigation over proposed completion of the canal. The offer is said to have been made by George J. Baldwin; Savannah, Southern associate of Stone & Webster and Benet, Shand & McGowan, Columbia, and T. Frank Watkins, Anderson, counsel for the company.

Seeks Line Discontinuance.—The Illinois Power & Light Corporation, Chicago, Ill., has applied to the Illinois Commerce Commission for permission to discontinue service on its line between Galesburg and Knoxville in Knox County.

Service Suspended.—The York Utilities Company, Sanford, Me., recently suspended service between Kennebunk and Wells. This suspension was in accordance with the announcement made a few weeks ago by the company. So far as is known no efforts are being made to resume service.

Purchase of Long Island Branch Recommended.—The New York Transit Commission has revived negotiations for the purchase for the city of the Whitestone division of the Long Island Railroad from Whitestone Landing to Flushing, L. I. The commission proposes to make the line an integral part of the city's rapid transit system, connecting it with the extension of the Corona elevated-subway line at Flushing. Vice-President LeBoutillier, acting head of the Long Island Railroad, is said to look with favor upon the proposal if suitable terms can be arranged. The city's Corona line now is nearing completion into Flushing. The extension would be connected physically with the Whitestone line, forming continuous trackage to the Borough of Manhattan.

J. C. Easley New Director at Richmond.—John C. Easley Richmond, was the only new director elected on April 16 at the annual meeting of the Virginia Railway & Power Company Richmond. He replaced P. M. Chandler, Philadelphia, resigned.

Merger of Subsidiaries Approved.—The Wisconsin Railroad Commission has approved the merger of six Wisconsin electric companies into the Eastern Wisconsin Electric Company, operating both city and interurban railways. The Eastern Wisconsin Company has controlled the six companies and in the petition to the Railroad Commission asking permission to merge the company declared that it was seeking more economical and uniform operation of all the companies and with the merging it would be in a position to improve service and carry out financing through one corporation instead of seven. The companies merged with the Eastern Wisconsin are the Wisconsin Light, Heat & Power Company, Madison; Janesville Electric Company, Mineral Point Electric Company, Badger Electric Company, Wisconsin Utilities Company and Middle Wisconsin Power Company. The Railroad Commission has authorized the Eastern Wisconsin Company to issue $2,115,900 of bonds for the purpose of retiring bonds of the companies taken over.

Personal Items

R. E. Danforth Consultant

Former New Jersey Official, After Complete Rest, Will Engage in Traction Work as Expert

Richard E. Danforth, who on April 1, 1924, retired from the vice-presidency and the general managership of the Public Service Railway, Newark, N. J., will retain a permanent consulting relation with the Public Service. He will make his headquarters for the present at Skaneateles, N. Y., but will visit Newark as may be necessary in the interests of the railway. Mr. Danforth has actually been away from his office for five months and does not intend to engage in any work for the remainder of the year other than such service as he may be called upon to perform for the Public Service. At the end of that time, however, he plans to establish himself as consultant, not only for the Public Service, but for banking and bond houses, and for other railways.

For this work Mr. Danforth has had remarkable experience as railway manager, engineer, and consultant, covering thirty-two years. After he was graduated from Cornell University in 1891, Mr. Danforth was for a year an apprentice with the Buffalo Railway; then for five years superintendent of the Buffalo, Bellevue & Lancaster Railway. With this preparation he became superintendent and purchasing agent of the Buffalo Railway, remaining as superintendent of the Buffalo lines of the International Railway after the formation of that company in 1899. In 1901 he designed the railway terminal for the Pan-American Exposition, a kind of work which he especially enjoyed. He left in that year, however, to become general manager of the Lake Shore Electric Railway. This property was handicapped by lack of funds and when it went into receivership, early in 1902, Mr. Danforth went to Rochester, N. Y., where he spent five years, first as assistant general manager, then as vice-president and general manager of the Rochester Railway.

SEVENTEEN YEARS SERVICE IN NEW JERSEY

Beginning in 1907 he was for exactly seventeen years general manager of the Public Service Railway, and for a considerable part of this period vice-president as well. As manager in New Jersey he succeeded Albert H. Stanley, now Lord Ashfield, who on April 1, 1907, sailed to assume the management of the Underground Railways of London. The Public Service property is enormous, but neither this nor the intricacy of the detail problems which were presented daunted Mr. Danforth. It is obvious that behind the remarkable career of the man there must be a strong personality. There is. Slight of frame, Mr. Danforth is characterized by keenness of mind, alertness of manner and great driving power. A strict disciplinarian, he has always tempered discipline with the kindliest of dispositions. One of his greatest satisfactions has been the affection with which his associates, including the rank and file of his employees, have regarded him. He has always been an approachable chief, and has been quick to give to department heads credit for their share in the results achieved by his department. His well known interest in vocational education is a natural corollary to his interest in men.

Mr. Danforth has always insisted on the best of accounting practice, stores accounting and operating detail records, and has been quick to avail himself of such records as a means to economical operation. These records were of great value to him in the activities of the past few years. He spent the better part of 1918 to 1922, inclusive, as an expert before courts and the Public Utility Commission or in the preparation for this work and in assisting attorneys in cross-examining opposing witnesses. At the same time he kept a close rein on the affairs of the Public Service Railway, carefully watching revenues and expenses. A tribute to his work in this connection is the reports of appraisers of the property who found it in 100 per cent operating condition in 1916, 1919 and 1921-22, in spite of strenuous cuts in the expenses made necessary by rising costs and limited rate of fare.

In accepting Mr. Danforth's resignation, President McCarter and the other directors of the Public Service expressed appreciation of the value of his efforts to keep the property safe and intact during the trying years of the war, and the almost equally trying years that have followed during the period of readjustment.

Dr. Ambrose Swasey Awarded John Fritz Medal

Dr. Ambrose Swasey, Cleveland, inventor, manufacturer, philanthropist and dean of the American engineering profession, has been presented with the John Fritz gold medal, one of the highest distinctions in world engineering. The ceremonies took place on the evening of April 23 in the Engineering Societies Building, New York, in the presence of distinguished engineers, scientists and educators from all over the country.

The award was made in recognition of Dr. Swasey's achievements "as a designer and manufacturer of instruments and machines of precision, a builder of great telescopes, a benefactor of education and the founder of Engineering Foundation."

The medal was originally established by these four national engineering societies in honor of a great American metallurgical engineer, John Fritz of Bethlehem, Pa. It has since become an international institution, and is now regarded as the highest engineering honor in America. This is the first time in four years that the medal has been awarded to an American.

J. W. Delaney has been appointed assistant to the master mechanic of the Market Street Railway, San Francisco, Cal. The master mechanic is J. M. Yount.

Frank P. Flinn has become master mechanic of the Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute division. The new appointee will relieve M. M. Nash, superintendent of the city lines, of all duties in connection with the maintenance of car equipment, giving him the opportunity of devoting all of his time to the traffic department. Mr. Flinn has been superintendent of the American Car & Foundry Company plant at Terre Haute for some time. Previous to coming to Terre Haute he was connected with the Westinghouse Machine Company and the Heyl & Patterson Engineering Company of Pittsburgh, Pa.

J. R. Abercrombie, secretary-treasurer of the St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., has been made secretary-treasurer of the Capital Gas & Electric Company, Topeka, Kan., formerly known as the Consumers Light, Heat & Power Company. Mr. Abercrombie was associated with the St. Joseph property for twenty-two years.

Eugene E. Stringer, who has been connected with the La Crosse, Wis., office of the Northern States Power Company as commercial manager, has been appointed acting manager of the company at Chippewa Falls to assume the duties of Albert Smith, formerly in charge of the electric railway, electric and gas departments.

Oscar B. Smith of Knox, Ind., has been appointed by Gov. Warren T. McCray of Indiana as a member of the Indiana Public Service Commission to succeed Oscar Ratts of Paoli. The appointment is effective May 1, with the expiration of the term of Mr. Ratts. Mr. Smith is one of the leading attorneys of northern Indiana. He is a former member of the State Senate, where he represented his own and another county. He has been Republican chairman of his county for six years.

N. S. Cumming, superintendent of the Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont., has been transferred to Toronto to superintend the Toronto Suburban Railway. He became superintendent of the St. Catharines property more than four years ago, succeeding W. R. Robertson, who resigned to accept a position with the Ontario Hydro-Electric Power Commission. Mr. Cumming before this appointment was chief clerk of the railway department of the Dominion Power & Transmission Company, in Hamilton A farewell to him was attended by his many employee friends in the railway business, who presented to him a gold watch and chain. In commenting on Mr. Cumming's success as a railroad operator, E. W. Oliver, general manager of the Canadian National Electric Lines, stressed the many difficulties which Mr. Cumming had surmounted while in charge of the property. He said that he had arranged for his transfer so that the Toronto Suburban Railway might have the benefit of his services.

Obituary

Arthur Warren

Arthur Warren, representative of the committee on public relations on the memorable tour of the country taken by members of the executive committee of the American Electric Railway Association in 1912, died in Bermuda on April 16. As it turned out, Mr. Warren and the members of that committee became the precursors of the more modern movement to place the case for the electric railways directly before the public. For the part that he took in this work Mr. Warren was particularly well qualified. He was London correspondent of the Boston *Herald* from 1887 to 1897, editorial and special writer for the same paper from 1897 to 1907, associate editor from 1907 to 1909 and dramatic critic of the New York *Tribune* from 1909 to 1912. He was also for many years associated in a confidential capacity with George Westinghouse, and had a great deal to do with formulating the publicity policy of the Westinghouse company in the early days. Mr. Warren was born in 1860, and besides his journalistic work was the author of a book, entitled "London Days," in which he described his British impressions.

Col. Robert Kirkup, ninety-two years old, pioneer brass foundryman and president of Robert Kirkup & Company, Cincinnati, one of the oldest manufacturers of brass castings in the Middle West, died at his home in Avondale, a suburb of Cincinnati, on April 12. Mr. Kirkup's death was due to injuries and shock suffered when he fell down stairs in his brass foundry in February. Mr. Kirkup was colonel of the Fifth Ohio Volunteer Infantry during the Civil War. He was born in Scotland and came to this country when he was twenty-eight years old.

Arthur Field, sales manager of the Standard Motor Truck Company, Pittsburgh, Pa., is dead.

Miss Sarah R. Harvey, auditor for the Trenton & Mercer County Traction Corporation, Trenton, N. J., died on April 18. Miss Harvey had been connected with the company for thirty years. She was a member of the Professional and Business Women's Club and the First Presbyterian Church, Trenton.

George W. McNulty, a builder of subways and conduit street railways, died recently in New York City at the age of seventy-three years. He was a civil engineer of note. After assisting in the construction of the Brooklyn Bridge he went into business for himself as a contractor. Then he became chief engineer of the Metropolitan Street Railway in New York and supervised the installation of the cable system on Broadway. Later he helped to build the subway from Times Square to Columbus Circle and was engineer for the Sunnyside Yard for the Pennsylvania Railroad. Still later he served with the Holbrook contracting firm in the building of many sections of the New York subways. He was one of the oldest members of the Engineers' Club.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Code of Business Ethics Formulated

Principles that Will Avert Restrictions Set Forth by U. S. Chamber of Commerce

A committee of the Chamber of Commerce of the United States has worked out a code of business ethics based on the "material needs of mankind" and the necessity of "increasing the wealth of the world and the value of happiness of life." The code will be submitted to the convention of the chamber at Cleveland on May 6. It follows:

The foundation of business is confidence, which springs from integrity, fair dealing, efficient service and mutual benefit.

The reward of business for service rendered is a fair profit plus a safe reserve, commensurate with risks involved and foresight exercised.

Equitable consideration is due in business alike to capital, management, employees and the public.

Knowledge—thorough and specific—and unceasing study of the facts and forces affecting a business enterprise are essential to a lasting individual success and to efficient service to the public.

Permanency and continuity of service are basic aims of business, that knowledge gained may be fully utilized, confidence established and efficiency increased.

Obligations to itself and society prompt business unceasingly to strive toward continuity of operation, bettering conditions of employment and increasing the efficiency and opportunities of individual employees.

Contracts and undertakings, written or oral, are to be performed in letter and in spirit. Changed conditions do not justify their cancellation without mutual consent.

Representation of goods and services should be truthfully made and unscrupulously fulfilled.

Waste in any form—of capital, labor, services, materials or natural resources—is intolerable, and constant effort will be made toward its elimination.

Excesses of every nature—the inflation of credit, overexpansion, overbuying, overstimulation of sales—which create artificial conditions and produce crises and depressions are condemned.

Unfair competition, embracing all acts characterized by bad faith, deception, fraud or oppression, including commercial bribery, is wasteful, despicable and a public wrong. Business will rely for its success on the excellence of its own service.

Controversy will, where possible, be adjusted by voluntary agreement or impartial arbitration.

Corporate forms do not absolve or alter the moral obligations of individuals. Responsibilities will be as courageously and conscientiously discharged by those acting in representative capacities as when acting for themselves.

Lawful co-operation among business men and useful business organizations in support of these principles of business conduct are commended.

Business should render restrictive legislation unnecessary through so conducting itself as to deserve and inspire public confidence.

The report was prepared by Judge Edwin B. Parker, umpire of the German-American Mixed Claims Commission of Washington; Paul W. Brown, editor of *America at Work*, St. Louis; William Butterworth, president of Deere & Company, Moline, Ill.; Henry S. Dennison, president of the Dennison Manufacturing Company, Framingham, Mass.; Noble Foster Hoggson, president of Hoggson Brothers, New York; James R. MacColl, president of the Lorraine Manufacturing Company, Pawtucket, R. I.; Henry T. Noyes, Rochester, N. Y., and George Rublee, Washington.

Trade Association Activities

Three Proposals to Define Right of Such Bodies Will Be Discussed at Commerce Meeting

Much still remains to be done to fix the exact status of the trade association with respect to its right to collect and disseminate information. Some precedents have been established and the correspondence of the National Lumber Manufacturers' Association, made public in February last, has helped the situation. In fact, one of the letters in the correspondence of that association was accepted as constituting the first public statement on behalf of a national association in interpretation of the requested informal opinion on the subject given to Secretary of Commerce Hoover by Attorney-General Daugherty. But that did not dispose of the situation. So in their own behalf members of the Chamber of Commerce of the United States have decided that trade associations and their activities shall go on the program for the Cleveland meeting, May 6 to 8.

In this connection three separate proposals concerning trade associations have been submitted by member organizations of the national chamber for consideration at the convention. Thus the Memphis Chamber of Commerce proposes that the national chamber should advocate creation of a commission which would define the rights of trade associations and their members in all respects, including their rights to discuss operating expense, sources of supplies for materials, prices, trade competition, etc. A study of anti-trust laws and of the Federal Trade Commission's powers and activities would be included. The purpose would be to establish recognized principles which would remove handicaps under which trade associations now operate, through fear that they may violate some law, rule or regulation and be called before a commission or the courts upon a criminal or civil charge the existence of which, regardless of the merits, is detrimental.

New Quarters for Westinghouse Interests in New York

The Westinghouse Electric & Manufacturing Company has moved its New York executive offices from 165 Broadway to 150 Broadway. The new building is known as the Westinghouse, and all departments of the company will hereafter conduct business from there. The Westinghouse Electric International Company and the Westinghouse Lamp Company will move into the new building next week-end. The Westinghouse interests will utilize the upper twelve stories of the twenty-three-story structure, the total space amounting to approximately 100,000 sq.ft.

New Metal for Car Building Promised

W. W. Atterbury, vice-president in charge of operation of the Pennsylvania Railroad, appeared before the Senate agricultural committee on April 19 in behalf of the Hooker-White-Atterbury offer for the government plant in opposition to that of Henry Ford. Mr. Atterbury promised the manufacture at Muscle Shoals of a new metal "that will revolutionize transportation." The scheme advocated by Mr. Atterbury looks to the manufacture of freight and passenger cars from a new metal that he discovered abroad during the war.

Mr. Atterbury said the new metal would be lighter than steel and almost as strong, and could be manufactured with waterpower much cheaper. He declared it could be used in the construction of both freight and passenger cars and he predicted that these would take the place gradually of those now in existence. Mr. Atterbury added that the new cars would cost less than those used today.

Almost at the same time that Mr. Atterbury was making his remarks discovery of a new alloy metal to take the place of steel in the near future was predicted by Dr. Arthur A. Hamerschlag, president of the Research Corporation. Dr. Hamerschlag said:

> We are on the threshold of an era of changes in the great field of metallurgy. Steel has ruled king of industry. Its position is being threatened by those who have been pioneering in the fields of the alloys. The inventor who can produce a new metal with the strength of steel, non-corrosive. lighter in weight, already is on the horizon.

Metal, Coal and Material Prices

Metals—New York	April 22, 1924
Copper, electrolytic, cents per lb.	13.437
Copper wire base, cents per lb.	15.875
Lead, cents per lb.	8.075
Zinc, cents per lb.	6.487
Tin, Straits, cents per lb.	49.625
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.20
Somerset mine run, Boston, net tons	2.175
Pittsburgh mine run, Pittsburgh, net tons	1.875
Franklin, Ill., screenings, Chicago, net tons	2.175
Central, Ill., screenings, Chicago, net tons	1.90
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.65
Weatherproof wire base, N.Y., cents per lb.	17.50
Cement, Chicago net prices, without bags.	$2.20
Linseed oil (5-bbl. lots) N. Y., per gal.	$0.93
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal.	$0.99

Rolling Stock

Salamanca, Olean & Bradford Railway, Salamanca, N. Y., has applied to the Public Service Commission for permission to place a bond issue to finance the purchase of three one-man safety cars.

Cincinnati, Georgetown & Portsmouth Railroad, Cincinnati, Ohio, has asked the authority of the State Public Utilities Commission to issue $17,000 of equipment trust certificates for the purpose of purchasing two interurban cars.

New Orleans Public Service, Inc., New Orleans, La., has contracted with the Perley Thomas Car Company, High Point, N. C., for fifty-five modern cars at an approximate cost of $700,000. The cars will be delivered this fall. The contract for the motor equipment and the air brakes was split between the Westinghouse Electric Company and the General Electric Company. The New Orleans property has also placed an order for four additional buses with the Yellow Coach Manufacturing Company, Chicago, Ill.

Track and Line

Madison Railways, Madison, Wis., will soon begin the double tracking of its line on University Avenue and Breeze Terrace.

Savannah Electric & Power Company, Savannah, Ga., is replacing the old track around the city market with new 114-lb. rail. The job when completed will cost approximately $5,000, of which $1,500 will be for repaving between the track and 2 ft. on each side. More than $250,000 will be spent on improvements during 1924. To complete the 1923 construction program it will cost $41,863, while the new work for the year which has just been approved is estimated to cost $275,111.

Trenton & Mercer County Traction Corporation, Trenton, N. J., will install steel ties in the Borough of Pennington.

Tri-City Railway, Davenport, Iowa, has completed approximately 4,000 ft. of new track. The proposed project consists of 2,675 ft. of double track and 1,300 ft. of single track. The company also reports progress on the Rockingham Road project, where new track is being laid preparatory to the paving of the street.

North Carolina Public Service Company, Greensboro, N. C., is improving its track between Spencer and Salisbury by lowering the rails almost on a level with the surface of the street.

Department of Street Railways, Detroit, Mich., will start track extensions on May 1, which will be carried to conclusion during the month of May. The extensions include laying of tracks on Livernois Avenue from Fenkell Avenue to Six Mile Road, as an extension of the Trumbull Avenue line. This has been referred to as the most important project recently announced. Three extensions are proposed for construction beginning May 1, and still another program of extensions and improvements of service is to be made public for June 1, it was announced. The East Warren line will be extended from St. Jean Avenue at least 1 mile farther east if the Department of Public Works proceeds with the grading and paving. Construction between Toledo Avenue and Michigan Avenue on the Scotten Avenue line will begin on May 1, and the Scotten line extended between Fort Street and Michigan Avenue. This line was commenced last year and construction work carried on between Fort Street and Toledo Avenue. When completed this will form a link in the loop for the Clairmount and Grand Belt cars.

United Railways, St. Louis, Mo., has been granted a permit by the St. Louis Board of Public Service to lay some 3 miles of T-rails to replace existing track in various parts of the city.

Shops and Buildings

Waterloo, Cedar Falls & Northern Railway, Waterloo, Iowa, suffered a loss of $8,000 when flames threatened its carhouse. Four cars were damaged.

Trade Notes

American Steel Foundries, Chicago, Ill., has moved from the McCormick Building to the Wrigley Building, 410 North Michigan Avenue.

K. D. Hequembourg, at one time director of exhibits and vice-president of the American Electric Railway Manufacturers' Association, has been appointed state commissioner of Missouri for the National Association of Builders' Exchanges. His duties will consist of acting as state representative of the national association, looking after state and local affairs. He will have the power to organize local associations. He has lately been executive secretary of the Builders' Exchange of St. Joseph, Mo.

Buda Company, Harvey, Ill., is extending its railway switch plant.

Economy Electric Devices Company, Chicago, Ill., has received an order from the Key System Transit Company, Oakland, Cal., for the equipment of all of the motor cars on that property with Economy meters. This order will call for about 450 meters.

J. M. Pneuman, Berea, Ohio, has been appointed sales agent for the Transit Equipment Company, New York.

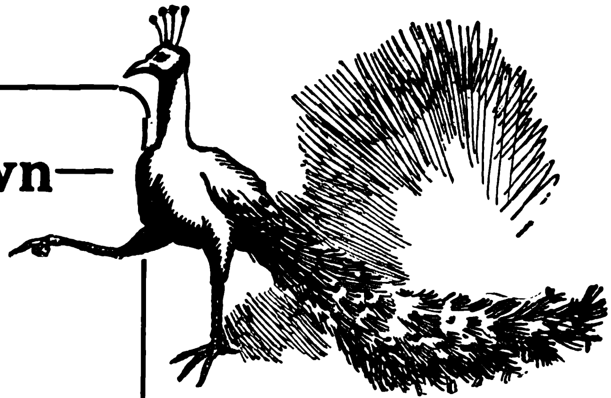
Union Switch & Signal Company will move its New York office from its present location in the Benenson Building, 165 Broadway, to the new Westinghouse Building, 150 Broadway, on May 1. The new quarters occupy the greater part of the twenty-second floor of the Westinghouse Building. They are larger and better arranged and can be reached more conveniently.

William Lintern, president of the Nichols-Lintern Company, Cleveland, Ohio, manufacturer of railway, vehicle and mill supplies, sails for Europe May 8 for an extended business trip.

New Advertising Literature

Heine Boiler Company, St. Louis, Mo., has issued Bulletin 54, an illustrated pamphlet on the bent-tube boiler V-type.

Tide Water Oil Sales Corporation, New York, N. Y., has issued "An Unusual History of Petroleum." The book is a reprint of twelve mailing pieces which were used during the past year in a direct advertising campaign among users of lubricating oils and greases.



The School burned down—

but not a child was lost!

Such news items occasionally *do* appear. When we read the details we invariably learn the children were saved because they had been drilled repeatedly for just such an emergency. They marched out calmly—to safety.

Practice does it!

That's why we're always urging hand brake practice. At least one stop every trip should be made with the emergency brake equipment. Then the motorman will know what to do if circumstances suddenly demand it.

But the equipment must be adequate, too!

All the fire drills in the world won't avail if stairways are too narrow or fire escapes are insufficient. And all the hand brake practice will be wasted unless the car actually can be stopped.

Where Peacock Staffless Brakes are used —the results are assured. Motormen trust their powerful grip—motormen are confident of their absolute control.

Peacock Staffless Brakes have a braking power limited only by the locking of the wheels. Their full braking power can be applied with almost instantaneous speed. And there is ample capacity to wind almost any length of chain.

Doesn't it pay to have equipment like this— and to use it?

National Brake Co., Inc.

890 Ellicott Sq., Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Company, Limited, Montreal, Canada

**PEACOCK
STAFFLESS
BRAKES**

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

The J. G. White Engineering Corporation
Engineers—Constructors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation Management
52 Vanderbilt Ave., NEW YORK

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation, Studies on Financial and Physical Rehabilitation Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

J. ROWLAND BIBBINS
Engineer—927 Fifteenth St., WASHINGTON
TRANSPORTATION SURVEYS
Organized Traffic Relief and Transit Development Co-ordinating Motor Transport, Railroad and City Plans, Service, Routing, Valuation, Economic Studies
EXPERIENCE IN 20 CITIES

JOE R. ONG
Consulting Transportation Engineer
Specializing in Traffic Problems and in Methods to Improve Service and Increase Efficiency of Operation
PIQUA, OHIO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINCKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND NEW YORK
1570 Hanna Bldg. 84 Pine St.

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

KELLY, COOKE & COMPANY
Engineers
149 BROADWAY NEW YORK
424 CHESTNUT STREET PHILADELPHIA

EDWIN WORTHAM, E.E.
Consulting Engineer
Valuations of Electric Railways and
Utilities of All Kinds
Traffic and Operating Studies
Allison Bldg. Richmond, Va.
Established Feb. 1913.

C. B. BUCHANAN, President
W. H. PRICE, JR., Sec'y-Treas.
JOHN F. LAYNG, Vice-President
BUCHANAN & LAYNG CORPORATION
*Engineering and Management, Construction,
Financial Reports, Traffic Surveys
and Equipment Maintenance*
BALTIMORE
825 Equitable Bldg.
Phone:
Hanover 2142
NEW YORK
49 Wall Street

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and
Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

Transmission Line and Special Crossing
Structures, Catenary Bridges
WRITE FOR OUR NEW DESCRIPTIVE CATALOG
ARCHBOLD-BRADY CO.
Engineers and Contractors SYRACUSE, N. Y.

HUMAN ENGINEERING
Railway Audit and Inspection Company, Inc.
Fourth and Chestnut Sts., Philadelphia
Boston, New York, New Orleans, Pittsburgh } BRANCHES { Baltimore, Atlanta, Chicago, St. Louis

Dwight P. Robinson & Company
Incorporated
Design and Construction of
Electric Railways, Shops, Power Stations
125 East 46th Street, New York
Chicago Youngstown Atlanta Philadelphia
Los Angeles Montreal Rio de Janeiro

The Most Successful Men in the Electric Railway
Industry read the
ELECTRIC RAILWAY JOURNAL
Every Week

THE P. EDWARD WISH SERVICE
50 Church St. *Street Railway Inspection* 131 State St.
NEW YORK DETECTIVES BOSTON

When writing the advertiser for information or
prices, a mention of the Electric Railway
Journal would be appreciated.

WHEN RAILWAY MEN

in general, study the question of *wood durability* for other purposes, as carefully as *Railway Signal* men have studied it for *Trunking* and *Capping*, there will be a lot more

"ALL-HEART"
"TIDEWATER"
CYPRESS
"THE WOOD ETERNAL"

used for *Fencing, Ties, Car Material, Station Construction* and similar railroad requirements, *to the very great economy of the companies using it.*

The long service which *"All-Heart" Tidewater Cypress* gives,

SAVES LABOR COSTS
FOR RENEWALS AND
REPLACEMENTS

—big items in themselves.
"All-Heart" Tidewater Cypress comes nearer being decay proof than any other wood.

This mark on every timber, board and bundle of *Tidewater* Cypress is your *insurance of true replacement economy.*

The data in support of these facts will be promptly furnished upon request.

SOUTHERN CYPRESS MFRS.' ASSN
1265 Poydras Building, New Orleans La., or
1265 Graham Building, Jacksonville, Fla.

Saves Labor

DAYTON

in the Car Barn!

As Well as on the Track

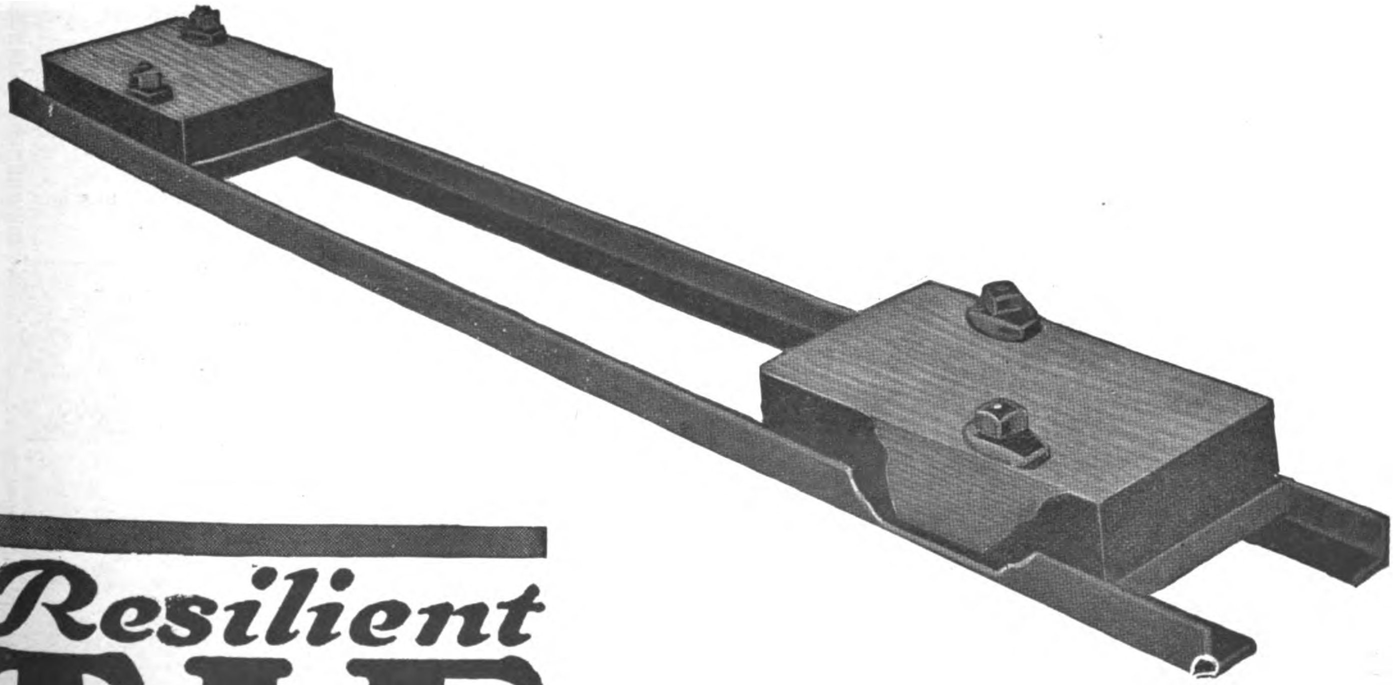
Dayton Resilient Track saves labor in the car barn by cutting down repairs to rolling stock. The resilient feature prolongs the life of all rolling stock by cushioning the shocks and jars.

Resiliency protects the concrete foundation from disintegrating shocks and reduces track and paving repairs.

Dayton Resilient Track saves labor in new track work because it can be easily installed by ordinary track laborers. By actual test, eight men have laid 500 feet in a day.

Thus does the Dayton Resilient Track make possible even a threefold labor economy—in the car barn, in track and paving repairs and in laying new track. There are other signal advantages. Investigate!

THE DAYTON MECHANICAL TIE CO.
707 Commercial Building
DAYTON, OHIO



Resilient
TIE

COMMERCIAL
COMPOUNDS
for every purpose
Leverite
Pothead Compound

THE NEW YORK-NEW JERSEY VEHICULAR TUNNEL
Two Tubes Under the Hudson River.
Total length 9,250 feet.
Outside diameter of tubes 29 ft. 6 in.
Width of roadway in each tube 20 ft.
Estimated annual traffic 5,610,000 vehicles.
Estimated cost $30,000,000.00.

Compounds are used everywhere!

In the "Vehicular Tunnel" pipe openings and joints in the shields are sealed with "Leverite"—Leverite was selected because it withstands air and water pressure, shock and high temperature; Oilproof Compound is used in the transformers; extensive use is also found for Dampproofing Compounds, Insulating Paint, etc.

MITCHELL-RAND
MAKES MANY MIXTURES

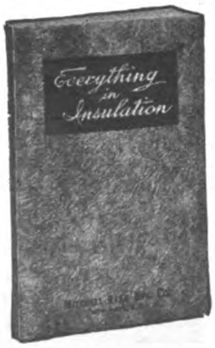
—practically every kind of Commercial Compound—Insulating Waxes for wire, Brake Lining Compounds, Electrotypers' Wax, Belt Dressing, Soldering Paste, Rubber Softeners and Fillers, etc., etc.—an almost endless variety.

Factory representatives and distributors: tapes, mica, fibre, varnished materials, papers, etc.

"Everything in Insulation"

Write for our 160-page handbook.

MITCHELL-RAND MFG. COMPANY
18 Vesey St., New York, N. Y.



Indoda

The Kaffirs have a strange ceremony to mark the transition from boy to man (indoda).

Kids are placed opposite each other and given stout switches with which they beat-up one another until their skins are swollen and bleeding.

At the cry of "halt" the judge looks into each one's eyes and if the slightest trace of tears appears—back he goes to boyhood.

The dry eyes pass into manhood.

Ability to stand punishment used to be the standard in judging a man's qualifications to run electrical machines—before Morganite brushes made that job easy.

Since operators have learned that commutation can be secured through Morganite prescription, they feel that they really have a gentleman's job.

Morganite Brush Co. Inc

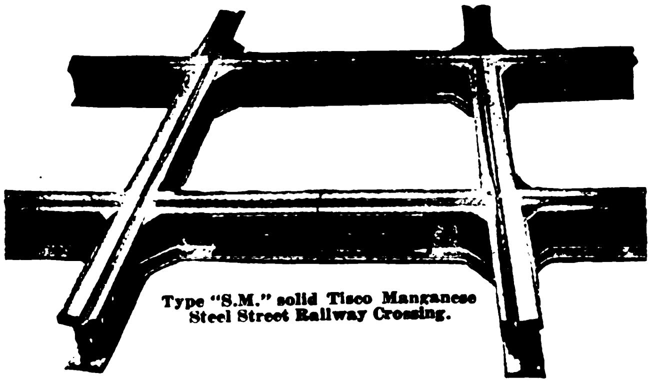
Main Office and Factory:
519 West 38th St., New York

DISTRICT ENGINEERS AND AGENTS:
Pittsburgh, Electrical Engineering & Mfg. Co., 909 Penn Ave.
Cincinnati, Electrical Engineering & Mfg. Co., 607 Mercantile Library Building.
Cleveland, Electrical Engineering & Mfg. Co., 422 Union Building.
Philadelphia, Electric Power Equipment Corp., 412 North 18th St.
Baltimore, O. T. Hall, Sales Engineer, 1926 Edmondson Ave.
Revere, Mass., J. F. Drummey, 75 Pleasant Street.
Los Angeles, Special Service Sales Co., 502 Delta Building.
San Francisco, Special Service Sales Co., 202 Russ Building.
Toronto, Can., Railway & Power Engineering Corp., Ltd., 131 Eastern Ave.

TAYLOR-WHARTON IRON & STEEL CO.

TIOGA STEEL & IRON CO. | **Wm WHARTON Jr. & CO. Inc.** | **PHILADELPHIA ROLL & MACHe**

Solid TISCO Manganese Steel Street Railway Crossing


Type "S.M." solid Tisco Manganese Steel Street Railway Crossing.

This crossing is cast in two pieces; the ends are shaped to suit any section of rolled rail, and fishplate bearings are ground true to take standard plain joints. This is but one of many types of work furnished by this Company to the electric railway industry.

Covering a long period of years, the engineering staff of Wm. Wharton Jr. & Co., Inc., has collaborated with many of the foremost railway engineers of this country and abroad in designing and fabricating some of the most successful trackwork in operation.

For standard and special trackwork this Company has unusual facilities.

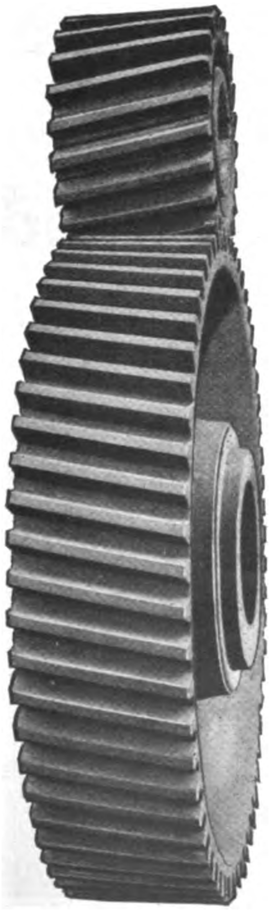
WM. WHARTON JR. & CO., Inc.
EASTON, PA.

Taylor-Wharton Iron & Steel Co.
Plant at High Bridge, N. J.
Manganese Steel
Wearing Parts

Wm. Wharton Jr. & Co.
Plant at Easton, Pa.
Special Trackwork
Cylinders for Gases

Tioga Steel & Iron Co.
Plant at Philadelphia, Pa.
Forgings
Hammered and Pressed

Phila. Roll & Machine Co.
Plant at Philadelphia, Pa.
Rolls and Rolling
Mill Machinery



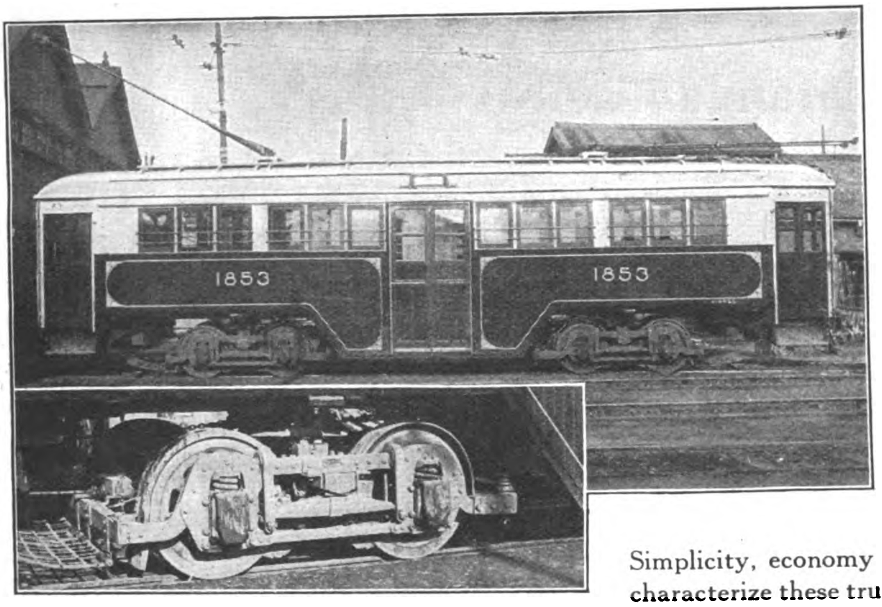
NO OTHER gear at any price assures you as good value for your money as the Nuttall BP Helical Gear. It saves your equipment, it saves 70% in gear cost and it lasts four times as long as any untreated gear.

Can you afford not to have BP Helicals on your equipment

R.D. NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

Baldwin Class "L" Trucks on Tokyo Municipal Electric Railway Cars



Type "L" Trucks on Tokyo Municipal Railway Cars

Where the clearance under the car body permits wheels of equal size, Baldwin Class "L" trucks give absolute satisfaction in city service. The side frames are of bar steel, arranged with the greater sectional dimension vertical to give maximum strength. The end frames are of angle iron. The motors are outside hung, permitting a short wheel base to be used.

Simplicity, economy and low cost of maintenance characterize these trucks. Full details upon request

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U. S. A. Cable Address, "Baldwin, Philadelphia"

1241

In a Language They Can Understand!

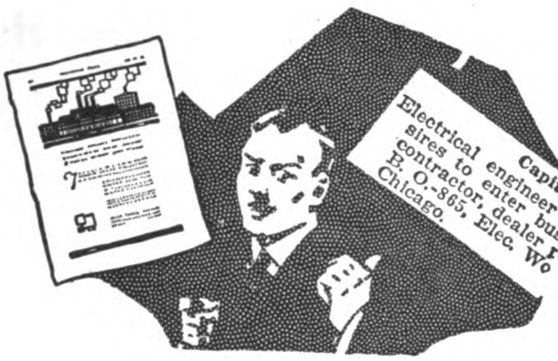
One kind of language is all your Directors understand and appreciate. That's the language of the black—not red—figures at the lower right hand corner of the monthly statements.

Here is the equipment to make those red figures black, and make the black ones larger.

St. Louis Quality double truck one-man safety cars are the latest development for efficient passenger transportation. Larger capacity, lower operating cost,—these mean greatly increased *net earnings*.

Write for Full Details

St. Louis Car Company
St. Louis, Mo.
"The Birthplace of the Safety Car"



Don't Overlook Opportunities

Men who regularly keep in touch with the market through other channels often overlook the many opportunities that are to be found in the

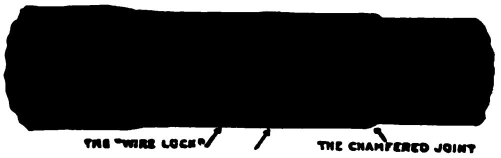
SEARCHLIGHT SECTION
For Every Business Want
"Think SEARCHLIGHT *First"*
0156

AMELECTRIC PRODUCTS
BARE COPPER WIRE AND CABLE
TROLLEY WIRE
WEATHERPROOF WIRE AND CABLE
PAPER INSULATED UNDERGROUND CABLE
MAGNET WIRE

AMERICAN ELECTRICAL WORKS. AMELECTRIC. Wires and Cables. PHILLIPSDALE, R.I.
Reg. U. S. Pat. Office
Incandescent Lamp Cord

AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.
Boston, 176 Federal; Chicago, 112 W. Adams;
Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

ELRECO TUBULAR POLES



COMBINE
Lowest Cost Lightest Weight
Least Maintenance Greatest Adaptability
Catalog complete with engineering data sent on request
ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
NewYork City, 30 Church Street

Hubbard Trolley Pole Bands

Split

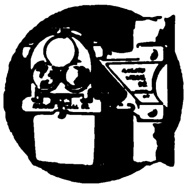
Made of Open Hearth Steel.
Galvanized by the Double-Dip process.
Your best insurance for long service and durability.
Ask Your Jobber

Solid

HUBBARD & COMPANY
Pittsburgh Chicago

Lapp Insulators
Lapp Insulator Co. Inc. LeRoy, N.Y.
Trade Mark

AUTOMATIC SIGNALS
Highway Crossing Bells
Headway Recorders
NACHOD SIGNAL COMPANY, INC.
LOUISVILLE, KENTUCKY.



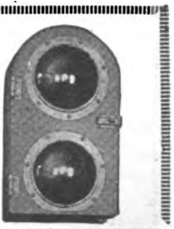
ANACONDA TROLLEY WIRE
ANACONDA COPPER MINING COMPANY
Conway Building, Chicago, Ill.
THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

Shaw Lightning Arresters
Standard in the Electric Industries for 35 years
Henry M. Shaw
150 Coit St., Irvington, Newark, N. J.

STANDARD
Wires, Cables, Cable Accessories
Superior quality, economical prices
Standard Underground Cable Co.
Boston Philadelphia Pittsburgh Detroit
New York Washington Chicago St. Louis
San Francisco

WELDING CABLE
ELECTRICAL WIRES and CABLES
John A. Roebling's Sons Company, Trenton, N. J.

Chapman
Automatic Signals
Charles N. Wood Co., Boston



American Rail Bonds

CROWN
UNITED STATES
TWIN TERMINAL
SOLDER
TRIPLEX

Arc Weld and Flame Weld

Send for new
Rail Bond Book

American Steel & Wire Company
CHICAGO
NEW YORK

Bethlehem Products for Electric Railways

Solid Manganese Tongue Switch, Design 905

Frogs, Switches, Special Trackwork, Rails, Car Wheels, Gear Blanks, Axles, Armature Shafts, Splice Bars, Bolts, Spikes, and Track Accessories.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
Sales Offices in the Following Cities:
New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Cincinnati Detroit Chicago St. Louis San Francisco

SPECIALISTS
in the
Design and Manufacture
of
Standard—Insulated—and Compromise Rail Joints

The Rail Joint Company
61 Broadway, New York City

Lorain Special Trackwork
Girder Rails

Electrically Welded Joints

THE LORAIN STEEL COMPANY
Johnstown, Pa.
Sales Offices:
Atlanta Chicago Cleveland New York
Philadelphia Pittsburgh
Pacific Coast Representative:
United States Steel Products Company
Los Angeles Portland San Francisco Seattle
Export Representative:
United States Steel Products Company, New York, N. Y.

High-Grade Track Work

SWITCHES—MATES—FROGS—CROSSINGS
COMPLETE LAYOUTS
IMPROVED ANTI-KICK BIG-HEEL SWITCHES
HARD CENTER AND MANGANESE CONSTRUCTION

New York Switch & Crossing Co.
Hoboken, N. J.

BARBOUR-STOCKWELL CO.
205 Broadway, Cambridgeport, Mass.
Established 1858

Manufacturers of
Special Work for Street Railways
Frogs, Crossings, Switches and Mates
Turnouts and Cross Connections
Kerwin Portable Crossovers
Balkwill Articulated Cast Manganese Crossings

ESTIMATES PROMPTLY FURNISHED

BUDA
ESTABLISHED
1881

Special Track Equipment and Layouts of all kinds

THE BUDA COMPANY
Harvey (Suburb Chicago) Illinois

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
TUCSON, ARIZ., 21 So. Stone Avenue
DALLAS, TEX., 2001 Magnolia Building
HONOLULU, H. T., Castle & Cooke Building
PORTLAND, ORE., 805 Gasco Building

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES
DETROIT, Ford Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-6 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building

AETNA INSULATION LINE MATERIAL
Third Rail Insulators, Trolley Bases, Harps and Wheels, Bronze and Malleable Iron Frogs, Crossings, Section Insulators, Section Switches
Albert & J. M. Anderson Mfg. Co.
289-93 A Street Boston, Mass.
Established 1877
Branches—New York, 135 B'way
Philadelphia, 429 Real Estate Trust Bldg. Chicago, 105 So. Dearborn St.
London, 12 Moor Lane, E. C. 2

DUNDEE "A" AND "B" FRICTION TAPES
Great Adhesive Strength
High Quality
Long Life
Price Right
Write for Samples and Circulars
THE OKONITE CO., Passaic, N. J.
Incorporated 1884
Sales Offices: *New York—Atlanta—Pittsburgh—San Francisco*
Agents: Central Electric Co., Chicago, Ill. Pettingell-Andrews Co., Boston, Mass.; The F. D. Lawrence Electric Co., Cincinnati, Ohio; Novelty Electric Co., Philadelphia, Pa.
Canadian Representatives: Engineering Materials Limited, Montreal.

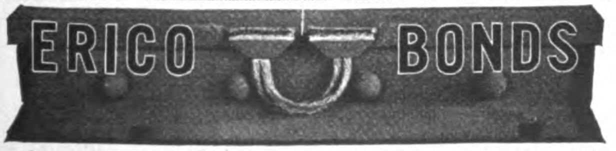
METAL SAFETY CROSS TIES
Eliminate from track assemblage all Spikes, plates, anchors, braces, lugs, bolts, etc.
REVOLUTIONIZES ROADBEDS
Write for descriptive folder and quotation.
METAL SAFETY RAILWAY TIE CO.
522 North American Bldg., PHILADELPHIA, PA.

GODWIN STEEL PAVING GUARDS
Adapted to all types of rails and paving.
W. S. GODWIN CO., Inc.
Proven by service to economically prevent seepage and disintegration of street railway paving.
Write for Illustrated Catalog No. 20.
Race & McComas Sts., Baltimore, Md.

RAMAPO AJAX CORPORATION
Ramapo Automatic Return Switch Stands for Passing Sidings
RACOR
TRADE MARK
RACOR Tee Rail Special Work.
Manganese Construction
GENERAL OFFICES: HILLBURN, NEW YORK
Chicago New York Superior, Wis. Niagara Falls, N. Y.
Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.
Electrical Machinery, Steam Turbines, Steam Engines, Condensers, Gas and Oil Engines, Air Compressors, Air Brakes

NEW and RELAYING RAILS
1 TON OR 1000
TRACK EQUIPMENT
L. B. FOSTER CO.
PITTSBURGH - PENNSYLVANIA
RAIL ACCESSORIES
NEW YORK - JERSEY CITY - PHILADELPHIA - HAMILTON, O.



THE ELECTRIC RAILWAY IMPROVEMENT CO.
CLEVELAND, OHIO

A Single Segment or a Complete Commutator
is turned out with equal care in our shops. The orders we fill differ only in magnitude; small orders command our utmost care and skill just as do large orders. CAMERON quality applies to every coil or segment that we can make, as well as to every commutator we build. That's why so many electric railway men rely absolutely on our name.
Cameron Electrical Mfg. Co., Ansonia, Connecticut

ECONOMIZERS
reduce fuel costs by making use of waste exhaust gases to preheat the boiler feed. Patented construction proven by 20 years of service.
FOSTER
SUPERHEATERS
improve engine, turbine and boiler economy by enabling a given amount of steam to do more work. Over 10,000 installations in stationary power plants.
POWER SPECIALTY CO., Boston, Philadelphia, Pittsburgh, Detroit Kansas City, Chicago, San Francisco, Dallas, London, Eng. 111 Broadway, NEW YORK

Beckwith-Chandler
VARNISHES and COLORS
for
Brush or Spray Application
Flat Color and Varnish Systems
Enamel Systems
Color Varnish Systems

Developed through years of experience in varnish and color manufacture, especially to meet transportation needs. Easily worked, quick drying—essentially durable.

Full Details on Request

BECKWITH-CHANDLER COMPANY,
193-211 Emmett St., Newark, N. J.
320 Fifth Ave., New York

BECKWITH CHANDLER'S
650

SCREECH!!**!
HOWL!!**
GRIND!!

All eliminated
by
MEXICAN
GRAPHITE CURVE GREASE

Unaffected by rain, heat or cold.
Cars won't scrape it off.
Adheres to the guard of the rail.

Write today for particulars.

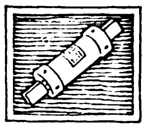
THE UNITED STATES GRAPHITE CO.
SAGINAW, MICHIGAN

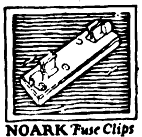
THE WORLD'S STANDARD
"IRVINGTON"
Black and Yellow
Varnished Silk, Varnished Cambric, Varnished Paper

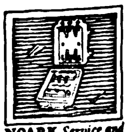
Irr-O-Slot Insulation Flexible Varnished Tubing
Insulating Varnishes and Compounds

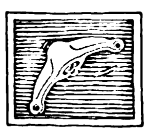
Irvington Varnish & Insulator Co.
Irvington, N. J.
Sales Representatives in the Principal Cities

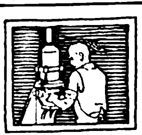
J-P Products of interest to Electric Railways

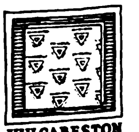

NOARK *Fuses*


NOARK *Fuse Clips* CUTOUT BASES


NOARK *Service and Underground Boxes*


Railway and Mine hangers and insulators

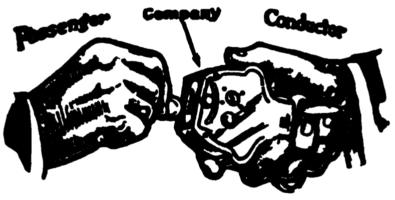

J-P Molding Service [Contract Basis]


VULCABESTON *Sheet and Rope Packing*

JOHNS-PRATT CO. HARTFORD, CONN.

Heywood-Wakefield
CAR SEATS
of pressed Steel for all Classes of Passenger Service. Rattan for covering seats and for snow sweepers.
HEYWOOD-WAKEFIELD CO.
Factory at Wakefield, Mass.
Offices at New York, Chicago, San Francisco

For detailed description — see — CAR BUILDERS CYCLOPEDIA 1922 Edition



Direct Automatic Registration By the Passengers
Rooke Automatic Register Co.
Providence, R. I.

PS HEATERS

Car Heating and Ventilation
are two of the winter problems that you must settle without delay. We can show you how to take care of both, with one equipment Now is the time to get your cars ready for next winter. Write for details.
The Peter Smith Heater Company
6209 Hamilton Ave., Detroit, Mich.

The Most Successful Men in the Electric Railway Industry read the

ELECTRIC RAILWAY JOURNAL

Every Week

OHMER FARE REGISTERS

They indicate and record the exact amount of each transaction. They place the sale of transportation on a strictly business basis.

We manufacture Indicating and Recording Fare Registers, Receipt Issuing Taximeters, and Fare Boxes.

OHMER FARE REGISTER CO.
Dayton, Ohio

Hale – Kilburn Seats

Suitable types for any kind of railway car or motor bus.

Neat
Light
Strong
Simple

Steel Seat Light Weight

It will pay you to consider Hale-Kilburn Seats for your new cars on the basis of (1) Passenger comfort, (2) Attractive appearance, (3) Lower maintenance.

Let us submit quotations

Hale-Kilburn Corporation
PHILADELPHIA

NEW YORK 30 Church St.
CHICAGO McCormick Bldg.
LOS ANGELES 447 E. 3d St.
RICHMOND Mutual Bldg.
ATLANTA Candler Bldg.
SAN FRANCISCO 71 First St.

Cleveland Fare Boxes
plus
SUPERVISION *of their use*
equals
100% Fare Collection

Let Us Put the Box Before You and Quote Prices

The Cleveland Fare Box Co.
Cleveland, Ohio

CANADIAN CLEVELAND FARE BOX CO. LTD.
Preston, Ontario

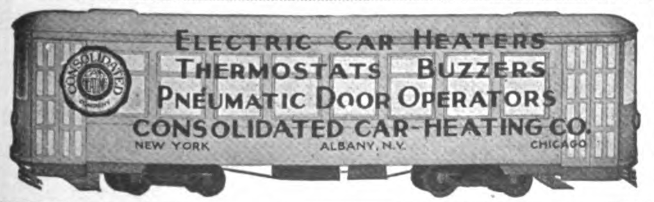
193
IN
10224
Type R-10

International Registers

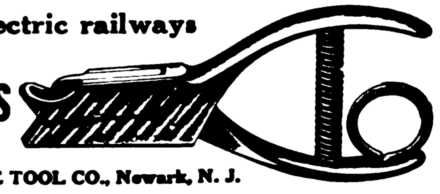
Made in various types and sizes to meet the requirements of service on street and city system. Complete line of registers, counters and car fittings.

Exclusive selling agents for HEEREN ENAMEL BADGES.

The International Register Co.
15 South Throop Street, Chicago, Illinois

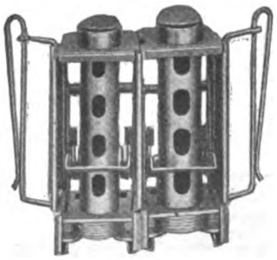


75% of the electric railways
use
B-V Punches



Send for Catalog
BONNEY-VEHSLAGE TOOL CO., Newark, N. J.

JOHNSON Universal Changer



Adjustable

The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

Flexible

Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

JOHNSON FARE BOX COMPANY
Ravenswood, Chicago, Ill.

Youre having brush trouble

CORRECT IT
USE LE CARBONE CARBON BRUSHES

They talk for themselves

COST MORE PER BRUSH
COST LESS PER CAR MILE

W. J. Jeandron
345 Madison Avenue, New York
Pittsburgh Office: 634 Wabash Bldg.
Chicago Office: 1657 Monadnock Block
San Francisco Office: 525 Market Street
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal and Toronto

Since
1907
Other Ry. Motor Gear Mfrs.
have brought out a total of
22 grades of gearing
each one "as good as Tool Steel"
BUT
Cincinnati "Tool Steel" is still
the Standard of Quality

Tool Steel Quality

The Tool Steel
Gear and Pinion Co.
CINCINNATI, O.

B. A. HEGEMAN, Jr., President
C. C. CASTLE, First Vice-President
H. A. HEGEMAN, Vice-Pres. and Treas.
F. T. SARGENT, Secretary
W. C. LINCOLN, Manager Sales and Engineering

National Railway Appliance Co.
Grand Central Terminal, 452 Lexington Ave., Cor. 45th St., New York

BRANCH OFFICES:
Munsey Bldg., Washington, D. C., 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Bldg., Chicago, Ill.

Tool Steel Gears and Pinions
Pittsburgh Forge & Iron Company's Products
Anglo-American Varnish Co., Varnishes, Enamels, Etc.
National Hand Holds
Drew Line Material and Railway Specialties
Genesco Paint Oils
Turnstile Car Corporation—Turnstiles
Dunham Hopper Door Device
Anderson Slack Adjusters
Economy Electric Devices Co., Power Saving and Inspection Meters
Ft. Pitt Spring & Mfg. Co. Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

Waterproofed Trolley Cord

SILVER LAKE A

Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.

FOR POSITIVE SATISFACTION ORDER
SILVER LAKE

If you are not familiar with the quality you will be surprised at its ENDURANCE and ECONOMY.

Sold by Net Weights and Full Lengths

SILVER LAKE COMPANY
Manufacturers of bell, signal and other cords.
Newtonville, Massachusetts

PROVIDENCE
FENDERS

H-B
LIFE GUARDS

The Consolidated Car Fender Co., Providence, R. I.
Wendell & MacDuffie Co., 110 E. 42nd St., New York
General Sales Agents

Gets Every Fare
PEREY TURNSTILES
or PASSIMETERS
Use them in your Prepayment Areas and Street Cars

Perey Manufacturing Co., Inc.
30 Church Street, New York City

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED

No.
478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

RAILWAY UTILITY COMPANY
Sole Manufacturers
"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings:
also ELECTRIC THERMOMETER CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for Catalogue

1328 Broadway
New York, N. Y.

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches	$4.50 an inch
4 to 7 inches	4.30 an inch
8 to 14 inches	4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

E.R.J.

POSITIONS VACANT

A GENERAL track foreman wanted to have charge of four or five gangs on construction and general track maintenance work in Connecticut. State qualifications and give references. P-671, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

WANTED—A-1 car wire and controller repairman, must understand the old type as well as the new. State wages expected in first letter. Apply Mr. H. T. Royal, Master Mechanic, Coast Cities Railway Co., Asbury Park, New Jersey.

POSITIONS WANTED

AS CHIEF inspector or instructor by a man who knows how to handle men and impart instruction; successful in one-man operation. PW-689, Electric Railway Journal, 10th Ave. at 36th St., New York.

AS MASTER mechanic; twenty years' experience in all departments, also type M. & H. L. control; can handle labor; A-1 references from past and present employers. PW-690, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

AUDITOR, with thorough experience large railway, electric and gas properties, seeks engagement. PW-677, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

GRADUATE engineer desires permanent position in larger field. Fifteen years' successful experience. Five in charge maintenance city and suburban system. Rehabilitation, design, special work, welding. PW-682, Electric Railway Journal, Real Estate Trust Bldg., Phila., Pa.

MASTER mechanic or engineer of equipment, technical education and five years' experience in manufacturing and maintenance of equipment. PW-681, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

SCHEDULES. Traffic manager and schedule maker, thoroughly experienced in city operation, wants whole or part time employment. PW-685, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

STEADY position wanted by young married man as armature winder or controller man; six years' experience in railway work; will work anywhere. B. Roller, 1600 19th Ave., Gulfport, Miss.

POSITIONS WANTED

SUPERINTENDENT or assistant general manager on city or interurban road. Twelve years' successful experience with first-class record and references. Salary $3,000.00 to start. PW-687, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT or general superintendent. Twelve years connection with one of the largest and most successful steam railways in America. Five years operator, agent and yardmaster; four years general yardmaster large terminal; three years superintendent in charge all departments electrified subsidiary lines, operating high speed interurban trains and handling heavy carload freight traffic. Desire connection with large electrified property. Have record for establishing new low operating ratios and rendering more effective service. Can secure spontaneous co-operation from employees and meet the public. Reason for leaving present position, electric railway field limited. Prefer situation requiring initiative and executive ability. Age 38. PW-686, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

Relaying Rails

NEW RAILS - ACCESSORIES

Buy Guaranteed Relaying Rails and Save 30% to 50%

1 Ton or 1000

LB FOSTER CO

PITTSBURGH, PA. NEW YORK CITY
JERSEY CITY - PHILADELPHIA - HAMILTON, O.

FOR SALE

FARE BOXES

70—Second-hand Johnson, Model D.

FS-688, Electric Railway Journal,
Tenth Ave., at 36th St., New York City

FOR SALE

Motors and Electric Locomotives

16—G. E. 203 A7 Motors.

4—Wh. 307 Motors.

1—26-ton Electric Locomotive.

Trucks, wide and standard gauge, bodies, air equipment, etc.

G. T. ABEL
700 97th St., Woodhaven, N. Y.

New Motor Repair Parts

IMMEDIATE SHIPMENT

We have in stock virtually every part necessary to complete all of the types of non-interpole motors. They are new and were manufactured by either the Westinghouse Company or the General Electric Company. They may be purchased at 20 per cent less than the manufacturers' present prices.

Send your orders to us and deduct 20 per cent from the current quotations.

What have you for sale?

TRANSIT EQUIPMENT CO.
Cars—Motors
501 Fifth Avenue, New York.

HAVE JUST PURCHASED
500 TONS 80 LB. ASCE
STRICTLY FIRST CLASS
RELAYING RAILS
Wire for Prices.
ZELNICKER IN ST. LOUIS

"SEARCHLIGHT"

Opportunity Advertising

—to help you get what you want.

—to help you sell what you no longer need.

Take advantage of it — For Every Business Want

"Think SEARCHLIGHT First"

0165

MOTORS For SALE

50 Westinghouse No. 101-B
40 Westinghouse No. 307
60 General Electric No. 80

Immediate Shipment Low Price

Electric Equipment Co.
Cars—Motors
601 Commonwealth Bldg., Phila., Pa.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
St. Louis Car Co.
Westinghouse E. & M. Co.

Babbitt Metal
Ajax Metal Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co., The

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
Brill Co., J. G., The
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Consolidated Car Heati'g Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Boilers
Babcock & Wilcox Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Brill Co., The J. G.
National Ry. Appliance Co
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co.
National Brake Co.
St. Louis Car Co
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
LeCarbone Co.
Morganite Brush Co., Inc.
Stackpole Carbon Co.
U. S. Graphite Co.
Westinghouse E. & M. Co.

Brushes, Graphite
U. S. Graphite Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Cables. (See Wires and Cables.)

Cambric Tapes, Yellow and Black Varnish
Irvington Varnish & Ins. Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
Brill Co., J. G., The
Differential Steel Car Co.
St. Louis Car Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heati'g Co.
Westinghouse E. & M. Co.

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Gas, Rail
Brill Co., J. G., The
St. Louis Car Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

Cars, Self-Propelled
Brill Co., J. G., The
General Electric Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
Bemis Car Truck Co.
St. Louis Car Co.

Castings, Malleable and Brass
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
St. Louis Car Co.

Catchers and Retrievers, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceiling Car
The Pantasote Co., Inc.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co

Cleaners and Scrapers Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Elec. Service Supplies Co.

Coils Armature and Field
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M Co.

Coin Counting Machines
Cleveland Fare Box Co.
Intern'l Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Elec. Service Supplies Co.
General Electric Co
Westinghouse E. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
General Electric Co.
Westinghouse E & M. Co.

Compressors, Air
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.

Compressors, Air Portable
Ingersoll-Rand Co.

Condensor Papers
Irvington Varnish & Ins. Co.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Consolidated Car Heat. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St Louis Car Co.
Westinghouse Tr. Br. Co.

Cranes
American Engineering Wks.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossing, Frog & Switch
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Crossing, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.

Crossings
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
The Pantasote Co., Inc.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co
Transit Equipment Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G
Consolidated Car H't'g Co.
General Electric Co.
Hale-Kilburn Co.
Nat'l Pneumatic Co., Inc.
St. Louis Car Co.

Doors & Door Fixtures
Brill Co., The J. G
Consolidated Car Heati'g Co.
General Electric Co.
Hale-Kilburn Co.
Morton Mfg. Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.

Ears
Ohio Brass Co.

Electrical Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Roebling's Sons & Co., J. A.

Electric Grinders
Railway Track-work Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Bibbins, J. Rowland
Buchanan & Lay Corp.
Day & Zimmerman, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelly-Cooke & Co.
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Railway Audit & Inspection Co.
Richey, Albert S.
Robinson & Co., Dwight P.
Sanderson & Porter
Stevens & Wood
Stone & Webster
White Eng. Corp., The J. G.
Wortham, Edwin

Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.

Fare Registers
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Flangeway Guards, Steel
Godwin Co., Inc., W. S.

Floodlights
Elec. Service Supplies Co.

Forgings
Brill Co., J. G., The

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Funnell Castings
Wharton, Jr. & Co., Wm.

Fuses and Fuse Boxes
Consolidated Car Heati'g Co.
General Electric Co.
Westinghouse E. & M Co

Fuses, Cartridge, Non-Refillable & High Voltage
Johns-Pratt Co.

Fuses, Refillable
General Electric Co.
Johns-Manville, Inc.
Johns-Pratt Co.
Power Specialty Co.

Gaskets
Westinghouse Tr. Br. Co.

Gas Producers
Westinghouse E. & M. Co.

Gas-Electric Cars
General Elec. Co.
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.
Brill Co., J. G., The

Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gong (See Bells and Gongs)

Graphite
Morganite Brush Co., Inc.

Greases (See Lubricants)

Grinders and Grind. Supplies
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Bricks and Wheels
Railway Track-work Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Anderson Mfg. Co., A.&J.M.
Elec. Service Supplies Co.
More-Jones Brass Metal Co.
Nuttall Co., R. D.
Star Brass Works
Thornton Trolley Wheel Co.

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Headlining
The Pantasote Co., Inc.

Heaters, Car (Electric)
Consolidated Car Heati'g Co.
Gold Car Heat. & Ltg. Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Elec. Service Supplies Co.
Smith Heater Co., Peter

Helmets—Welding
Railway Track-work Co.

Hoists, Portable
Ingersoll-Rand Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating Signals
Oskel Equipment Co.

Instruments Measuring, Testing and Recording
Elec. Service Supplies Co.
General Electric Co.
Johns-Pratt Co.
Westinghouse E. & M. Co

Insulating Cloth, Paper and Tape
General Electric Co.
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Stand. Underground Cable Co.
Westinghouse E. & M Co.

Insulating, Silk & Varnish
Irvington Varnish & Ins. Co.

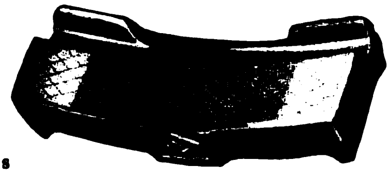
Insulation (See also Paints)
Anderson Mfg. Co., A. & J. M.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Westinghouse E. & M. Co

Insulation Slots
Irvington Varnish & Ins. Co.

Insulators (See also Line Materials)
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co
Elec. Service Supplies Co.

Brake Shoes
A.E.R.A. Standards
Diamond "S" Steel Back is the Best Type

Standard Patterns for
SAFETY CAR

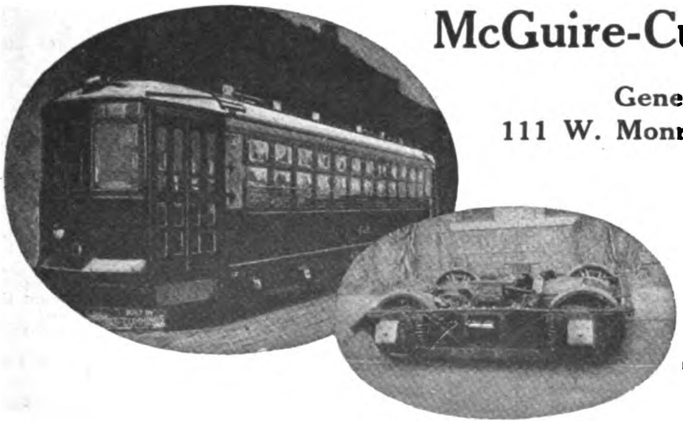


D-67 for Narrow Treads
D-87 for Wide Treads

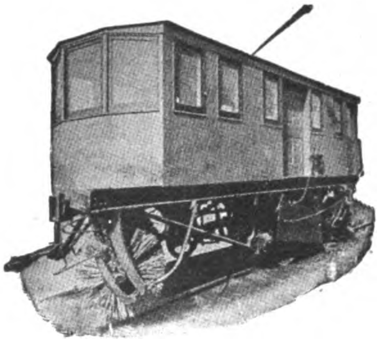
American Brake Shoe and Foundry Co.
30 Church Street, New York
332 So. Michigan Ave., Chicago Chattanooga, Tenn.

Ingersoll-Rand Pneumatic Tie Tampers
Reduce track tamping
and maintenance costs.
Ask for Bulletin 9123
INGERSOLL-RAND COMPANY
11 Broadway, New York 170-TT

McGuire-Cummings Manufacturing Co.
General Offices:
111 W. Monroe St., Chicago, Ill.



Street Cars
Trucks
Snow Sweepers



TULC
A LUBRICANT
We make a specialty of
ELECTRIC RAILWAY
LUBRICATION
We solicit a test of TULC
on your equipment
The Universal Lubricating Co.
Cleveland. Ohio
Tulc, Inc., Eastern Representative,
1617 Gotham National Bank Bldg., New York City

MORE-JONES
"TIGER" BRONZE
AXLE & ARMATURE
BEARINGS
Strong-tough-durable
anti-frictional
economical
MORE-JONES BRASS & METAL CO
ST. LOUIS MISSOURI

General Electric Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Cranes, Hoists and Lifts)
Buda Co.
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
Anderson Mfg. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.
Ohio Brass Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Protection
Anderson Mfg. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson Mfg. Co., A.&J.M.
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Wharton, Jr. & Co., Wm.

Locomotives, Electric
Baldwin Locomotive Works
General Electric Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricating Engineers
Galena Signal Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co.
Universal Lubricating Co.

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Castings
Wharton, Jr. & Co., Wm.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.
Wharton, Jr. & Co., Wm.

Manganese Steel Switches Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters (See Instruments)

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses (See Buses, Motor)

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
Allis-Chalmers Mfg. Co.
General Electric Co.

Motormen's Seats
Brill Co., J. G.
Elec. Service Sup. Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Barbour-Stockwell Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Hubbard & Co.

Oils (See Lubricants),

Omnibuses (See Buses, Motor)

Oxy-Acetylene (See Cutting Apparatus, Oxy-Acetylene)

Packing
Elec. Service Supplies Co.
Power Specialty Co.
Westinghouse E. & M. Co.

Paints and Varnishes (Insulating)
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.

Paints, Varnishes, Preservatives
Beckwith-Chandler Co.

Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co

Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoe & Fdy. Co

Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears)

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Power Specialty Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Elec. Ry. Equipment Co.
Hubbard & Co.

Pole Reinforcing
Hubbard & Co.

Poles & Ties Treated
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.

Poles, Ties, Posts, Piling & Lumber
Bell Lumber Co.
International Creosoting & Construction Co.
National Pole Co.
Southern Cypress M'f'r's Ass'n

Poles, Trolley
Bell Lumber Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

Porcelain Special High Voltage
Lapp Insulator Co., Inc.

Portable Grinders
Buda Co.

Potheads
Okonite Co

Power Saving Devices
National Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Rail Joint Co., The

Rail Joints—Welded
Lorain Steel Co.

Rails, Relaying
Foster Co., L. B.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Foster Co., L. B.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Rail Welding
Railway Track-work Co.

Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Ohmer Fare Register Co.
Rooke Automatic Rg. Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Elec. Service Sup. Co.

Resistances
Consolidated Car Heat. Co.

Resistance, Wire and Tube
General Electric Co.
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Roofing, Car
The Pantasote Co., Inc.

Sanders, Track
Brill Co., The J. G.
Elec. Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
St. Louis Car Co.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.

Seats, Bus
Brill Co., J. G., The
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co, The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
The Pantasote Co., Inc.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co.
Transit Equipment Co.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings, Center and Side)

Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
Wood Co., Chas. N.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A.&J.M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
More-Jones Metal & Brass Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)
Irvington Varnish & Ins. Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Steel and Steel Products
Carnegie Steel Co.

Steel Castings
Wharton, Jr. & Co., Wm.

Steps, Car
Brill Co., J. G., The
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Ohio Brass Co.

Strand
Roebling's Sons Co., J. A.

Subway Boxes
Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.
Power Specialty Co.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switches, Safety
Johns-Pratt Co.

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Switches and Switchboards
Anderson Mfg. Co., A. & J.M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Tamper Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.

Terminals, Cable
Std. Underground Cable Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Consolidated Car Heat. Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

Ties, All-Metal
Metal Safety R. R. Tie Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

Ties and Tie Rods, Steel
Barbour-Stockwell Co.
Carnegie Steel Co.
International Steel Tie Co.

Tool Steel
Bethlehem Steel Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Tongue Switches
Wharton, Jr. & Co., Wm.

Torches, Acetylene (See Cutting Apparatus)

Towers and Transmission Structures
Archbold-Brady Co.
Westinghouse E. & M. Co.

Track Expansion Joints
Wharton, Jr. & Co., Wm.

Track Grinders
Railway Track-work Co.

Trackless Trolley Cars
Brill Co., J. G., The
St. Louis Car Co.

Track, Special Work
Barbour-Stockwell Co.
Bethlehem Steel Co.
Buda Co.
New York Switch and Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Transfer (See Tickets)

Transfer Issuing Machines
Ohmer Fare Register Co.

Transfer Tables
American Bridge Co.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Material, Overhead
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolley Wheel Bushings
More-Jones Brass & Metal Co.

Trolley Wheels & Harps
More-Jones Brass & Metal Co.
Thornton Trolley Wheel Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Roebling's Sons Co., J. A.

Trucks, Car
Baldwin Locomotive Works
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Tubing, Yellow & Black Flexible Varnish
Irvington Varnish & Ins. Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Turbines, Water
Allis-Chalmers Mfg. Co.

Turnstiles
Elec. Service Supplies Co.
Percy Mfg. Co., Inc.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers & Silks
Irvington Varnish & Ins. Co

Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Welded Rail Joints
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welders, Portable Electric
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
General Electric Co.
International Oxygen Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Welding Steel
Elec. Ry. Improvement Co.
Railway Track-work Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.
Carnegie Steel Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

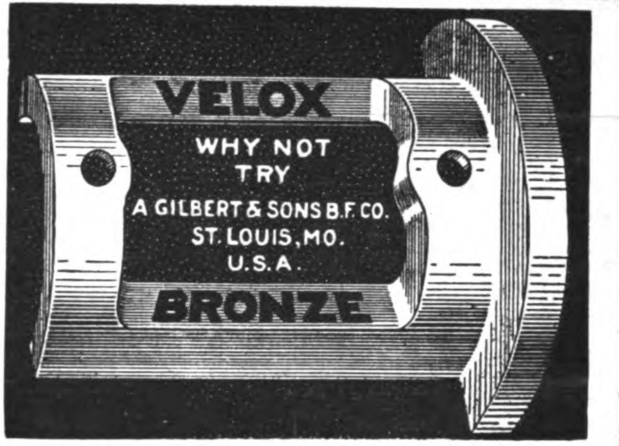
Wire Rope
Roebling's Sons Co., J. A.

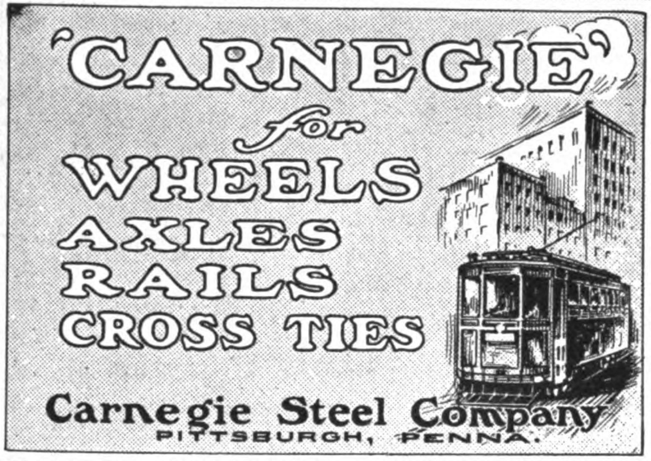
Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Okonite Co.
Roebling's Sons Co., J. A.
Std. Underground Cable Co.
Westinghouse E. & M. Co.

The Kalamazoo Trolley Wheels

have always been made of entirely new metal, which accounts for their long life WITHOUT INJURY TO THE WIRE. Do not be misled by statements of large mileage, because a wheel that will run too long will damage the wire. If our catalogue does not show the style you need, write us—the LARGEST EXCLUSIVE TROLLEY WHEEL MAKERS IN THE WORLD.

THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.


VELOX
WHY NOT TRY
A GILBERT & SONS B.F. CO.
ST. LOUIS, MO.
U.S.A.
BRONZE



Tests Prove That Fewer Inspections Are Required

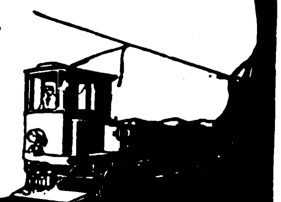
This fact about the Thornton Side Bearing Trolley Wheel is due to the method of lubrication and the extremely long life of the bearings. The construction insures a perfectly balanced wheel and freedom from vibration and noise. Users are getting over 50,000 miles from the side bearings. Write for Bulletin.

Thornton Trolley Wheel Co.
Incorporated
Ashland, Kentucky

The Differential Car

An automatic dump car, an electric locomotive, a snow plow, and a freight car—all in one. Big savings shown in track construction and maintenance, paving work, coal hauling, ash disposal, snow removal, and freight transportation.

The Differential Steel Car Co.
Findlay, Ohio



AJAX
M.C.B.
9"x17

IN THE REPAIR SHOPS

There are many cars *not* equipped with

AJAX CAR BRASSES

The cars that *are* equipped with Ajax Brasses keep on the road, day after day

The Ajax Metal Company
Established 1880
Philadelphia, Pa.
NEW YORK CHICAGO BOSTON CLEVELAND

N-L STOP SIGNAL
Simple in Operation, Installation and Maintenance

Canadian Representative:
Railway & Power Eng. Corp.,
Toronto, Ontario

The Nichols-Lintern Co.
7960 Lorain Ave., Cleveland, Ohio

"Boyerized" Products Reduce Maintenance

Bemis Trucks
Case Hardened Brake Pins
Case Hardened Bushings
Case Hardened Nuts and Bolts
Manganese Brake Heads
Manganese Transom Plates
Manganese Body Bushings
Bronze Axle Bearings

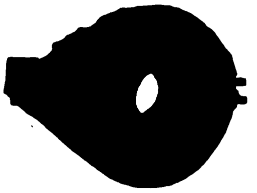
Bemis Pins are absolutely smooth and true in diameter. We carry 40 different sizes of case hardened pins in stock. Samples furnished. Write for full data.

Bemis Car Truck Co., Springfield, Mass.

"OSKELITE"

The Stop Light for street cars. Operates from brake system. Details on request.

The Oskel Equipment Co.
940 McCormick Bldg., Chicago, Ill.



CHILLINGWORTH
One-Piece Gear Cases
Seamless—Rivetless—Light Weight
Best for Service—Durability and Economy. *Write Us.*

Chillingworth Mfg. Co.
Jersey City, N. J.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Page

A

Ajax Metal Co 39
Allis-Chalmers Mfg. Co 31
Allison Co., J. E 23
Alumino-Thermic Corp 40
Amer. Brake Shoe & Fdy. Co 37
American Car Co 41
American Electrical Works 29
American Steel & Wire Co 30
Anaconda Copper Mining Co 29
Anderson Mfg. Co., A. & J. M 31
Archbold-Brady Co 23
Arnold Co., The 22

B

Babcock & Wilcox Co 31
Baldwin Locomotive Works 28
Barbour-Stockwell Co 30
Beckwith Chandler Co 32
Beeler, John A 22
Bell Lumber Co 40
Bemis Car Truck Co 39
Bethlehem Steel Co 30
Bibbins, J. Rowland 22
Bonney Vehslage Tool Co 33
Brill Co., J. G 41
Buchanan & Layng Corp 23
Buda Co 30

C

Cameron Electrical Mfg. Co 31
Carnegie Steel Co 39
Chillingworth Mfg. Co 39
Cleveland Fare Box Co 33
Collier, Inc., Barron G. Co 14
Consolidated Car Fender Co 34
Consolidated Car Heating Co 33

D

Day & Zimmermann Co., Inc 22
Dayton Mechanical Tie Co 24-25
Differential Steel Car Co 39

E

Electric Equipment Co 35
Electric Railway Equipment Co. 29
Electric Ry. Improvement Co 31
Electric Service Supplies Co 11

F

Ford, Bacon & Davis 22
Foster Co., L. B 31
"For Sale" Ads 35

G

Galena-Signal Oil Co 15
General Electric Co .. 16, Back Cover
Gilbert & Sons Brass Foundry Co., A 39
Godwin Co., W. S 31
Gold Car Heating & Ltg. Co 34

H

Hale-Kilburn Company 33
"Help Wanted" Ads 35
Hemphill & Wells 22
Heywood-Wakefield Co 32
Holst Englehard W 22
Hubbard & Co 29

I

Ingersoll-Rand Co 37
International Creosoting & Construction Co 12
International Register Co., The. 33
International Steel Tie Co 9
Irvington Varnish & Insulator Co 32

J

Jackson, Walter 22
Jeandron, W. J 34
Johnson & Co., J. R 40
Johnson Fare Box Co 33
Johns-Pratt Co 32

K

Kelly-Cooke Co 22
Kuhlman Car Co 41

L

Lapp Insulator Co., Inc 29
Le Carbone Co 34
Lorain Steel Co 30

M

McGuire Cummings Mfg. Co 37
Metal Safety Railway Tie Co 31
Mitchell-Rand Mfg. Co 26
More-Jones Brass & Metal Co 37
Morganite Brush Co., Inc 26
Morton Mfg. Co 40

N

Nachod Signal Co., Inc 29
National Brake Co., Inc 21
National Pneumatic Co., Inc 13
National Pole Co 8
National Railway Appliance Co 34
New York Switch & Crossing Co. 30
Nichols, Lintern Co 39
Nuttall Co., R. D 27

O

Ohio Brass Co 7
Ohmer Fare Register Co 33
Okonite Co., The 31
Ong, Joe R 22
Oskel Equipment Co 39

P

Parsons, Klapp, Brinckerhoff & Douglas 22
Perey Mfg. Co 34
Positions Wanted and Vacant 35
Power Specialty Co 31

R

Rail Joint Co 30
Railway Audit & Inspection Co., Inc 23
Railway Track-work Co 6
Railway Utility Co 34
Ramapo-Ajax Co 31
Richey, Albert S 22
Robinson Co., Dwight P 23
Roebling's Sons Co., John A 29
Rooke Automatic Register Co 32

S

St. Louis Car Co 28
Samson Cordage Works 40
Sanderson & Porter 22
Searchlight Section 35
Shaw, Henry M 29
Silver Lake Co., The 34
Smith Heater Co., Peter, The 32
Southern Cypress Mfrs. Assn 23
Stackpole Carbon Co ... Front Cover
Standard Underground Cable Co. 29
Star Brass Works 39
Stevens & Wood, Inc 22
Stone & Webster 22
Stucki & Co., A 40

T

Thornton Trolley Wheel Co 39
Tool Steel Gear & Pinion Co 34
Transit Equipment Co 35

U

U. S. Graphite Co 32
Universal Lubricating Co 37

W

"Want" Ads 35
Wason Mfg. Co 41
Westinghouse Elec. & Mfg. Co., 2, 4-5
Westinghouse Traction Brake Co. 10
Wharton, Jr., & Co., Wm 27
White Engineering Corp., The J. G 22
Wish Service, The P. Edw 23
Wood Co., Chas. N 29
Wortham, Edwin 23

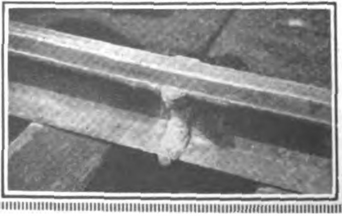
SAMSON SPOT WATERPROOFED TROLLEY CORD
Trade Mark Reg. U. S. Pat. Off.
Made of extra quality stock firmly braided and smoothly finished.
Carefully inspected and guaranteed free from flaws.
Samples and information gladly sent.
SAMSON CORDAGE WORKS, BOSTON, MASS.

100 New Users in the Last Nine Months
KASS SAFETY TREADS
HIGH
in efficiency and lasting qualities
LOW
in weight, initial and upkeep costs
Morton Manufacturing Co., Chicago

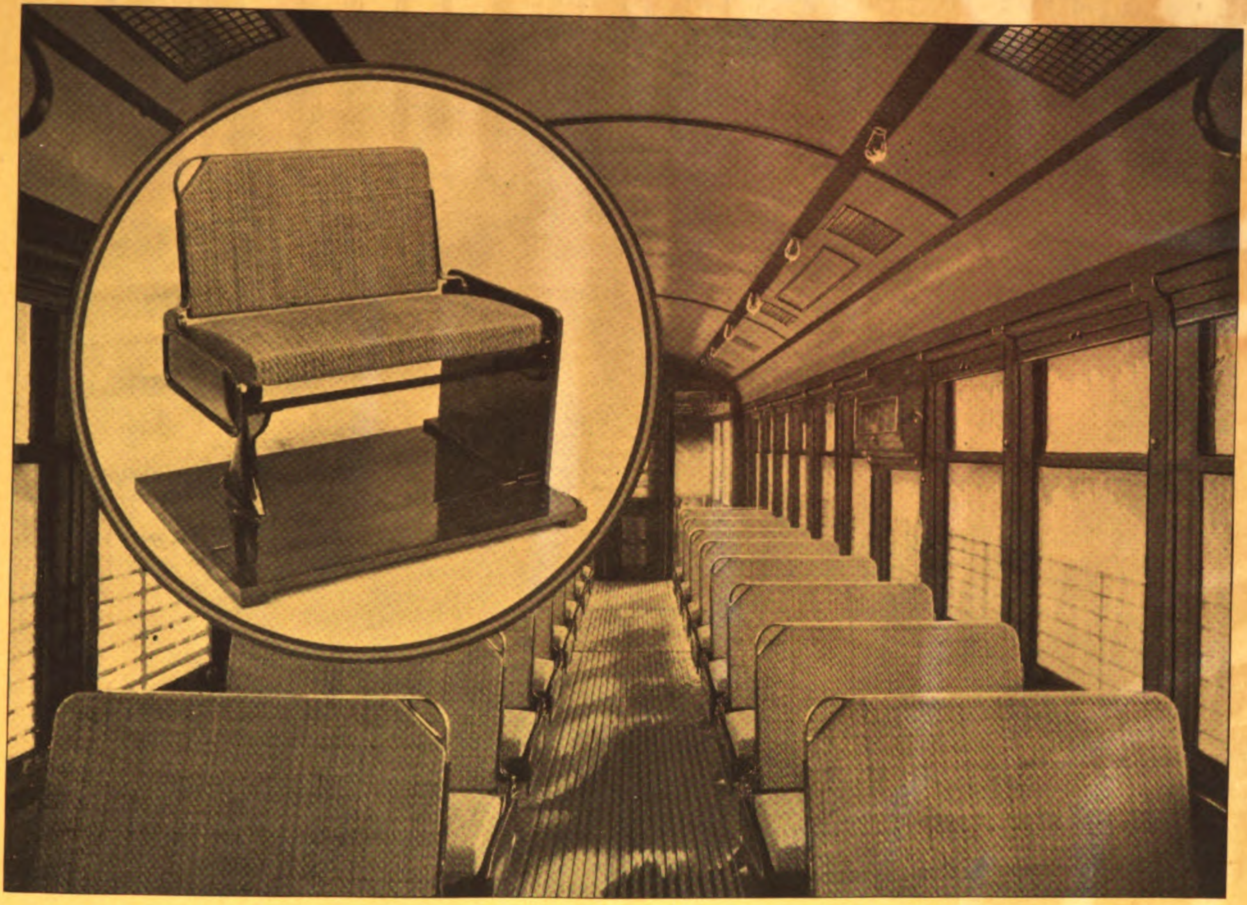
Northern CEDAR POLES Western
We guarantee
all grades of poles; also any butt-treating specifications
BELL LUMBER COMPANY
Minneapolis, Minn.

"Axle Specialists Since 1866"
Address all Mail to Post Office Box 515, Richmond, Va.
CAR AXLES
J. R. JOHNSON AND CO., INC.
FORGED STEEL AXLES
For Locomotives, Passenger, Freight and Electric Cars
Smooth Forged or Rough Turned—Carbon or Alloy Steel—Plain or Heat Treated, Forged and Turned Piston Rods, Crank Pins, Large Shafts, Round Bars, etc.

STUCKI SIDE BEARINGS
A. STUCKI CO.
Oliver Bldg.
Pittsburgh, Pa.



FERALITE
ALUMINO-THERMIC JOINTS
New and independent process. No inserts needed. Up-to-date and economical.
Alumino-Thermic Corp., Roselle Park, N. J.



Brill "Winner" Seats in Chicago

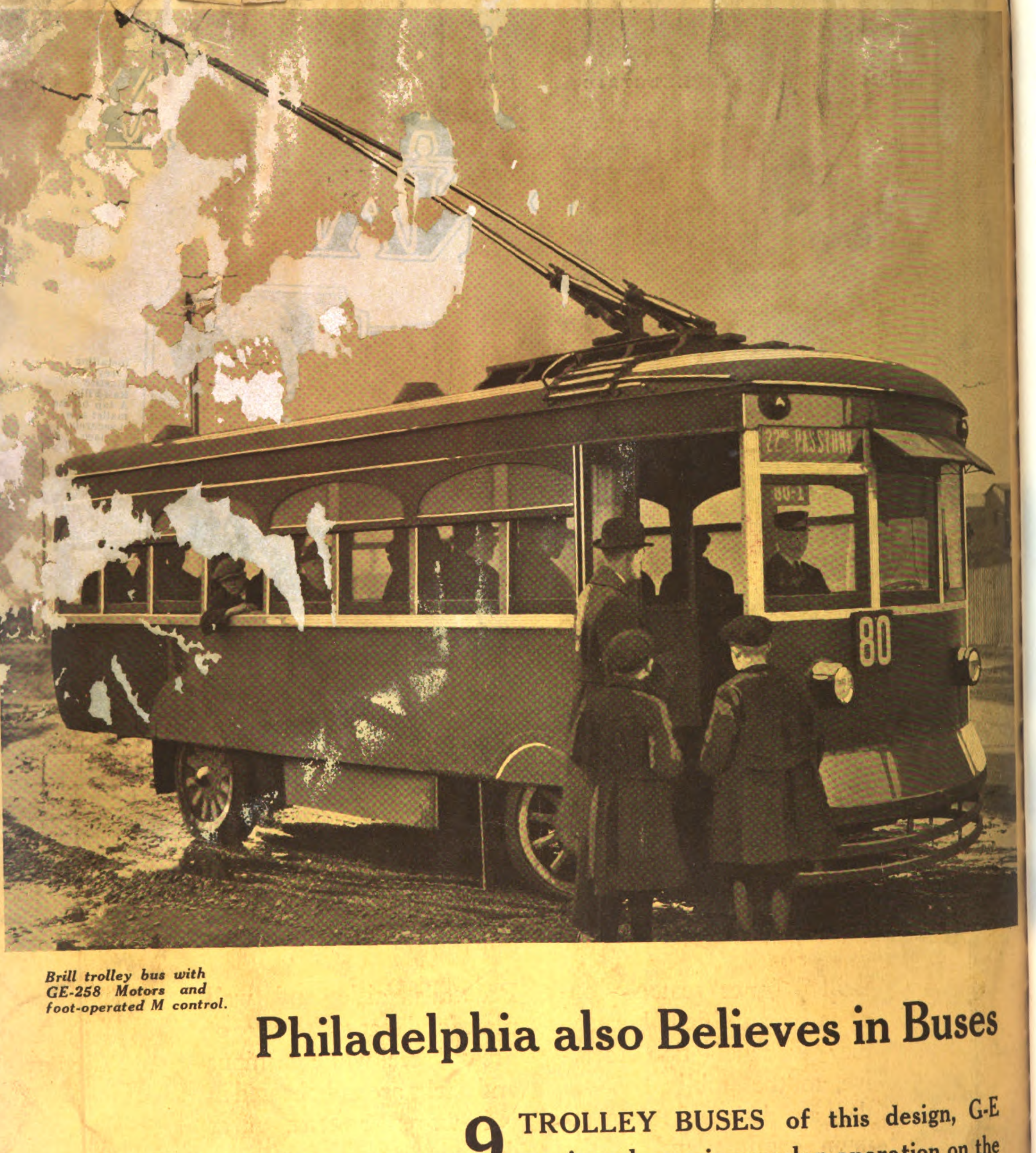
Brill "Winner" seats are continually specified because they give satisfaction in servive, to the public because they are designed for maximum comfort and to the operating company because they are light in weight yet sturdily built to meet the service requirements.

Pedestals, aisle and wall plates and seat rockers are of pressed steel while cushions and backs are upholstered in twill-woven rattan or as desired.

Chicago's latest double-truck cars were equipped with Brill "Winner" Seats.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO.
G.C. KUHLMAN CAR CO. — CLEVELAND, OHIO
WASON MANF'G CO. SPRINGFIELD MASS.

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA



Brill trolley bus with GE-258 Motors and foot-operated M control.

Philadelphia also Believes in Buses

9 TROLLEY BUSES of this design, G-E equipped, are in regular operation on the Oregon Avenue Line of the Philadelphia Rapid Transit Company.

As an auxiliary to present service, the trolley bus offers an opportunity. Have *you* considered it?

General Electric Company
Schenectady, N. Y.
Sales Offices in all Large Cities

35-383

GENERAL ELECTRIC

MX 001 195 526

HECKMAN
BINDERY INC.
NOV 87
N. MANCHESTER,
INDIANA 46962

MX 001 195 526

HECKMAN
BINDERY INC.
NOV 87
N. MANCHESTER,
INDIANA 46962

MX 001 195 526

HECKMAN
BINDERY INC.
NOV 87
N. MANCHESTER,
INDIANA 46962